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NOTES FOR THE MONTH

THIS Act imposes as from March 1, 1932, a customs duty of 10 per cent. of the value of all goods imported into the United Kingdom, with the exception of articles specified in the free list, and goods for the time being chargeable with a duty of customs under any other enactment.

The Act also provides for the imposition of additional duties, over and above the 10 per cent. duty, on certain classes or descriptions of goods, by order of the Treasury on the recommendation of the Import Duties Advisory Committee.

Goods from the Colonies and Protectorates are exempted from duty; and goods from the self-governing Dominions, India and Southern Rhodesia will be admitted free of duty until November 15, 1932, or such later date as may be fixed by the House of Commons.

Imports of certain fresh fruits, vegetables and flowers which are chargeable with duties under the Horticultural Products (Emergency Customs Duties) Act, 1931, will not be subject to duty under the Import Duties Act during the periods they are chargeable with the Horticultural Products duties.

The following is a list of the agricultural products or manurial requirements included in the free list:—

Wheat in grain.

Maize in grain.

Meat, that is to say, beef, veal, mutton, lamb, pork, bacon, ham and edible offals, but not including extracts and essences of meat or meat preserved in any airtight container.

Live quadruped animals.

Flax and true hemp (*Cannabis sativa*), not further dressed after scutching or decorticating; tow of flax and true hemp (*Cannabis sativa*).

Cotton seed, rape seed and linseed.

Wool and animal hair (raw), whether cleaned, scoured or carbonised or not; rags of wool not pulled; wool noils; and wool waste not pulled or garnetted.

Hides and skins (including fur skins, but not including goat skins), raw, dried, salted or pickled, but not further treated.

Mineral phosphates of lime.

Potassium carbonate, chloride and sulphate; kainite and other mineral potassium fertilizer salts.

Soya beans.

The Import Duties Advisory Committee are receiving a considerable number of inquiries as to their course of procedure and as to the form in which representations either in regard to the addition of articles to the free list under the Import Duties Act or in regard to the imposition of additional duties should be submitted to them. They desire to point out that the power to add articles to the free list is limited during the first six months of operation of the Act to cases of special urgency, while additional duties can only be imposed "in respect of goods of any class or description which are chargeable with the general *ad valorem* duty, and which, in their opinion, are either articles of luxury or articles of a kind which are being produced or are likely within a reasonable time to be produced in the United Kingdom in quantities which are substantial in relation to United Kingdom consumption." Applicants are asked to pay special attention to these limiting conditions in any representations they may desire to submit.

* * * * *

In view of its great nutritive value, its drought-resistant qualities, and its capacity to produce large crops over a series of years when once established, lucerne

Lucerne Growing

might be grown much more widely in this country than it is. It is a valuable food for all classes of stock, and should assist in reducing labour costs. It is, further, a wonderful soil improver. During the last thirty years the acreage of lucerne in Australia, New Zealand, and North and South America has increased enormously, especially in dairying and stock-raising districts; indeed, so important is the crop regarded in the United States, where it is known as alfalfa, that it figures prominently in modern "Western" ranching fiction. In this country, unfortunately, lucerne is yet far from being a household word. Farmers have often complained of the difficulty of securing a good plant, especially in the west and north, where they have put the blame on the climate. Recent research at Rothamsted has shown that a

common cause of failure in districts outside East Anglia is the lack of the appropriate nodule bacteria in the soil. These can now readily be supplied from cultures. For the rest, failure is commonly due to an attempt to grow the crop on weedy land or in soil that is shallow, wet or acid. There is no reason to suppose that average climatic conditions anywhere in England or Wales will prevent the establishment of lucerne on suitable land and with sound methods of husbandry.

Lucerne is one of the most nutritious fodder plants, and is consumed readily by all stock. It is so rich in protein that hay made from lucerne can largely replace concentrates and thus effect an appreciable saving ; while it is richer in minerals, especially lime and phosphorus, than most other crops, and its use for indoor feeding is an insurance against mineral deficiency. When pastures are bare, as happens during drought years, and often during early summer in a normal season, a crop of lucerne upon suitable land can be relied upon to remain green, owing to its roots penetrating deeply into the subsoil. Lucerne is probably the best renovating crop there is, partly because of its deep roots, which break up and utilize the subsoil, and partly owing to its ability to gather and retain nitrogen from the air. In short, taking it all round, lucerne is worth several serious efforts, if need be, to ensure a successful stand, and it should take a worthy place in helping many farmers to improve their position.

Lucerne shares with sainfoin the distinction of being the principal fodder in the cheese and dairy districts of France, and in Germany is looked upon as the best preparation for sugar-beet. In this country there is a tradition that the effects of a crop of lucerne can be felt for as many years as the crop has been down, and Mr. Christopher Turnor has grown good root and straw crops for eight years without the application of any nitrogenous manure after ploughing up a five-year stand of lucerne. An experiment at Rothamsted some years ago showed that the beneficial effects of lucerne on oats and barley were felt for at least three years afterwards.

There is ample practical experience as to the value of lucerne for feeding stock. It is, of course, not suggested that lucerne or any single fodder should be the sole food of an animal, but lucerne, having a high albuminoid ratio, can economically supplement poorer feeding-stuffs.

Actual yields of lucerne, obtained during trials organized from Rothamsted, and distributed over the West, Midlands

and North of England, gave an average per cutting of 5 tons per acre green. The farmer can expect two or three cuttings each season after the seedling year. Further, the average yield of single cuttings in the first year was 68·7 cwt. per acre of green lucerne, and this indicates that, with proper cultivation, no year need be lost while waiting for the crop to become established.

In the west and north of England and, in the Midland counties (more especially when lucerne is sown down in corn) it is always advisable to supply the nodule bacteria by the process of seed "inoculation," developed at Rothamsted by Dr. H. G. Thornton. After liming, inoculation may also be requisite even in East Anglia, in places where the land has become sour and the bacteria have been killed out.

During the past two seasons the acreage under lucerne in the Midlands has increased by over 50 per cent. and in the west of England by 40 per cent. There is throughout England and Wales scope for an immensely extended use of lucerne. An article by Messrs. Thornton and Nicol appears on page 46. It will be observed that they recommend drilling of the seed, but some other authorities prefer broadcasting it. In present circumstances, broadcasting is probably preferable if the land is really clean and in good heart; the labour for hoeing can ill be spared nowadays.

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DURING January, the Prince of Wales counselled a policy of boldness and originality on the part of the youth of the nation. To what extent can this counsel

Modern Farming : be applied to agriculture ? As far as

The Bold Line arable farming is concerned, it is quite clear that present-day methods no longer serve, labour costs being too high in relation to the prices of produce. Farmers are attempting to meet this problem by a more general use of machinery, the boldest spirits by complete mechanization.

The modern light internal combustion engine bids fair to revolutionize arable farming : its potentialities for service increase from year to year. Only a few years ago three to four acres of ploughing per day were regarded as a fair output for a tractor ; now six to ten acres can be done in the same time. Combine-harvesters have also demonstrated their efficiency both in wet and in dry seasons, in light and in heavy crops.

Compared with horse cultivation modern tractor equipment will save £1 per acre in the preparation of a seed-bed

for corn, and the combine harvester-thresher may save a further similar amount in harvesting and threshing costs.

Farming systems are being gradually adapted to the use of such machinery. One of the pioneers in mechanized farming is experimenting with a three-course rotation, namely, 66 per cent. corn and 33 per cent. cleaning cash crops, such as potatoes, sugar-beet and peas for picking green or canning. He does not, however, visualize a system of this kind as suitable for all classes of arable land. On lighter soils the need of organic matter is recognized. To meet this, he suggests a seeding of trefoil or trefoil and Italian rye-grass, costing 6s. or 7s. an acre, in the second of the two cereal crops, for ploughing in towards the end of May, to be followed by a bastard fallow or a crop of mustard or rape ploughed in before an autumn cereal.

It is by no means intended that live stock should be ruled out of the mechanized farm, though live stock can only be justified so long as they pay their way. "The feeding of cattle at a loss in order to make dung to grow crops to feed more cattle at a loss seems a vicious circle." The same argument is applied to arable sheep. Gross output is one thing : profit is another.

There are, however, few districts where the farming is so predominantly arable, or suitable for arable, that some grass land is not attached to the farm and must be used for the appropriate stock. Dairy cows and sheep are most likely to leave a profit, and both fit in well with the three-course system indicated. Marrow-stem kale and mangolds would occupy a portion of the fallow "break" along with a clover mixture for grazing or for hay.

Pigs are also suitable for the mechanized farm : they consume the farm by-products and, running in the yards in winter, tread the straw and make valuable manure.

In contrast with this type of arable farming, we know that year by year more and more arable land is being laid down to grass. On the basis of existing knowledge and experience, however, unless a balance is preserved between grass and arable the cattle and sheep from the rearing districts cannot be marketed to advantage. Cattle and sheep may be fattened on the best grass land between May and October, but farmers are unlikely to attempt winter fattening unless winter green crops are available. If farmers could guarantee no more than summer supplies of home-grown beef and mutton, the butcher's demand for the home-grown product would tend to disappear.

Boldness and originality, however, are not confined to arable farming. The more adventurous spirits are achieving almost equally striking success in improving and developing grass land for the winter feeding of stock. Winter shortage is being remedied by means of fertilizers and the encouragement of winter-green grasses. Lambing is being advanced by weeks, and even months. Early in January were to be seen sturdy lambs from Kent ewe tegs, a breed that normally lambs in April. The conservation of grass and lucerne for winter fattening is making progress along two distinctly promising lines—artificial drying and ensilage. The future may indeed show that arable land is less necessary for live stock husbandry than it is generally believed to be. In the oldest of all industries, however, progress must necessarily be gradual; there are many pitfalls, and it is well to bear in mind the words of one leading pioneer of mechanization. "There is a tendency," he says, "when any innovation is projected, to carry it to extremes. Advocates of farm-mechanization already see visions of the horseless farm, the grubbing up of all hedges and obstructions, and the entire change over to the new system. In my way of thinking, it is a new mental attitude that is required immediately, and a more gradual assimilation of new methods as these prove their economic worth. Meanwhile, if we hope to make our fallow area pay its way by means of the stock, why grub up fences and lay our countryside waste before it is necessary? While we are changing over to a more mechanized system, why eliminate horses until we are certain that we shall not need them?"

* * * * *

At a recent conference at the Ministry, called to consider the increased use of home-grown food-stuffs, a number of proprietors and representatives of large catering establishments, including railway and shipping companies, stressed the fact that they could use large quantities of milk-fed lamb in the first three months of the year if suitable supplies were forthcoming. Pending the outcome of further inquiries as to the exact requirements of the trade, farmers might be considering how best such a demand could be met. On account of the increase in the number of grass flocks, and the corresponding decrease in arable flocks, the supply of fat lamb has become unbalanced. It exceeds requirements in the summer and autumn months, and is too exiguous or too

irregular at other seasons to ensure a steady demand. Anticipating this eventuality, some farmers have, for a number of years, been trying to breed lambs earlier, and it is now not uncommon for lambing, in grass flocks, to begin in January instead of, as formerly, in March. There seems to be no great difficulty in advancing the date of lambing. January lambing has been accomplished, this year, with such normally late breeds as the Welsh and the Kent. The former were old ewes running on lowland pasture, the latter were tegs breeding for the first time. The popular Scotch half-bred will also lamb in January. In dealing with ewes, lambing can be advanced a little each successive year; with strong tegs, it seems possible to stimulate early breeding from the start.

Many farmers, even in regions where winters are generally open and mild, preclude early breeding because they consider it entails increased cost of feeding. But where pastures have been improved so that they start growth earlier in spring and continue growing later into the autumn or even winter, and where a proportion of the pasturage has been specially saved for winter keep, the cost of early lambing need not frighten anybody. Many farmers would be astonished to find how well ewes and lambs thrive on fresh winter pastures, helped out when necessary with good hay (which is surely cheap enough) and some kale or mangolds. Rock salt, also, should always be within reach.

The lambing pen is another bogey. In most parts of the south, in recent years, at all events, grass flocks have lambed successfully out-of-doors in January with no more than natural shelter around the fields. But January lambing will merely help to even out supplies and relieve, to some extent, the summer glut. If fat lambs are to be provided in January, February and March, lambing will have to begin in September and go on through the remainder of the year. For September or October lambing, only the Dorset Horn can be relied on. The Dorset Down, in the district round Bridgwater, lambs in November and December, and would probably do so elsewhere. Most of the Down breeds can be got to lamb in December.

When full advantage can be taken of our latest knowledge on pasture improvement, both as regards plant species and fertilizers, autumn lambing is relatively economical, for in the milder districts grass is then plentiful and nutritious. Furthermore, the "fly" season is practically over and the flock requires comparatively little attention.

Lambing practically all the year round would not, on this reckoning, tend to a reduction in the number of breeds, which

many people seem to regard as an essential of agricultural reorganization. For the early-lamb market, however, the main essential is weight-for-age, namely, 70-80 lb. alive or 35 to 40 lb. dead at 12 to 14 weeks old. At that early age, there is a remarkable similarity between the carcasses of different breeds and crosses. The essentials are a good milking ewe and a good quality ram of early-maturing breed with his mutton on the right places.

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ONE of the most striking changes in dairy husbandry in this country during the last ten years has been the growing attention devoted to the rationing of

**Recent Progress
in the Rationing
of Dairy Cows**

dairy cows, and no one has taken a greater part in this improvement than Mr. R. Boutflour, both in his work as Agricultural Officer to the Wilts County Council and subsequently as Director of Dairy Husbandry at the Harper Adams Agricultural College. It is therefore felt that the following notes may prove of general interest. They are based on a report made to the Ministry by Mr. Boutflour on his relinquishing this work to take up the position of Principal of the Royal Agricultural College, Cirencester.

By 1922 research workers had obtained a great deal of knowledge of the problem of rationing dairy cows, and Kelner's standards for maintenance and production had been accepted by animal nutrition workers, who were beginning to appreciate the necessity for feeding according to yield. The matter, however, received little attention in County Advisory work, and farmers were unaware of the important developments that were taking place. The method of feeding generally depended upon giving large quantities of roots, chaffed straw, hay, and a fixed amount of concentrates, the higher-yielding cows probably getting an extra handful. The majority of compounded feeding stuffs then on sale were not balanced properly, and little attention was given to the watering of cows.

In 1770, Arthur Young stated that "A good cow will give 9 gallons of milk per day and a middling one will give 6 gallons," while, in 1794, Culley mentioned cows giving 36 quarts of milk per day. According to the yields being obtained in 1922, however, it would appear that not only had no progress then been made in the feeding of dairy cows, but that the methods in general use were less successful than those practised in the eighteenth century. In fact, the feeding of cows was, in the

great majority of cases, simply a matter of routine and received no more thought than the removal of dung from cow houses.

As milk production was the chief interest in the county of Wilts, Mr. Boutflour decided, on taking up his appointment there in 1922, that this subject ought to receive the chief attention in the county scheme of agricultural education. If the results of work such as that being done by Mr. Mackintosh at the National Institute for Research in Dairying could be made known to farmers in such a way that it would be acceptable to them, great all-round improvement in dairy husbandry could be hoped for.

As much publicity as possible was given to Mr. Mackintosh's recommendations, which were :—

- (1) To feed a standard maintenance ration ;
- (2) To feed a balanced production ration ;
- (3) To feed according to yield ; and
- (4) To prepare cows for their lactation.

Ample information on the first three recommendations was available, but very little work had been done on the preparation of cows for calving. A satisfactory method was evolved, however, and given the name of "Steaming up." A number of farmers took the advice offered, and in many instances the results were to reduce costs and obtain more milk.

Hitherto, improvements in rationing had been advocated with the one object of reducing costs, and there was no suggestion that the output of milk might be increased at the same time. The feasibility of doing this was shown, however, by the experience of a farmer who, after his herd had been rationed, reported a saving of 6s. per day on feeding stuffs and an increase of 7 gal. of milk per day. As milk at this time was realizing 1s. 8d. per gal. the increase was even more important, economically, than the saving on feeding stuffs. It was, therefore, decided to seek methods by which even greater yields could be obtained.

It was found that with some cows the rations given produced indigestion, particularly where cows were being fed for high yields. Farmers put this down to the large amounts of concentrated foods that were being fed, but as a reduction of concentrates would have been followed by a falling off in yield it was decided to try to prevent indigestion by limiting the amount of the other foods.

The general maintenance ration used consisted of :—

- 14 lb. Hay
- 7 lb. Chaffed oat straw
- 56 lb. Roots

and it was found that the cutting out of chaffed oat straw led to less indigestion and improved milk yields, while, of course, the saving in labour was considerable. However, the higher yielding cows still seemed to suffer from indigestion and the hay was reduced and indigestion disposed of. This led to a tendency to scour, but rather than go back to the hay and return to indigestion the roots were reduced.

This adjusted matters and led to further improvement, and it became obvious that, when allowed to do so, cows would eat far more food than they could deal with usefully, especially when receiving large quantities of concentrates for the production of high yields. Under such conditions cows were bound to suffer from indigestion, but this could be avoided by the reduction of roughage, followed by a reduction of roots which would no longer be essential.

In order to demonstrate these findings to farmers throughout Wiltshire a number of herds in different parts of the county were directed and supervised by Mr. Boutflour, and these registered the highest herd averages in the county. It was noticed that cows so rationed showed no increases on going out to grass in the spring.

It was one thing to have something of value to impart to farmers, but quite another to obtain their interest. To arrest their attention, certain statements, of which the following are examples, were made and repeated again and again :—

- (1) Cows can be fed without roots.
- (2) Farmers don't know how to feed cows.
- (3) If a cow is properly managed indoors, no increase of milk will occur on going out to grass.
- (4) Chaff cutters kill cows.
- (5) Cows can give more milk without roots than with them.

These statements led to much controversy ; much controversy led to much publicity ; and much publicity led to many inquiries and to many herds being rationed. Everything possible was done, therefore, to keep alive the controversy, and, although kindled in 1923, it still glows and every now and again breaks into flame. This does good by concentrating attention on the very important question of the rationing of dairy cows.

Along with the work on rationing cows many other factors bearing on high yields were studied and investigated experimentally, such as the pros and cons of milking and watering three times a day. From such investigations a definite system embodying all that had proved valuable was evolved ; this was written up and published in the *Journal of the British Dairy Farmers' Association*. In 1926, at the request of the

Ministry, Mr. Boutflour undertook a month's lecture tour throughout the country, in which 26 lectures were delivered to audiences totalling some 8,000 persons.

In October, 1926, Mr. Boutflour was appointed Director of Dairy Husbandry at Harper Adams Agricultural College, and this afforded him an opportunity to give advice, and to lecture, to farmers throughout England and Wales. During Mr. Boutflour's tenure of this office from 1926-31, he gave 358 lectures and demonstrations to a total attendance of over 47,000. The article that had originally appeared in the *Journal of the British Dairy Farmers' Association* was re-written and issued in booklet form.*

In 1927 a herd of British Friesian cows was established at Harper Adams Agricultural College, through the generosity of the British Friesian Society, who made a gift of £1,000. This herd, which was tuberculin-tested, was used to demonstrate the system of rationing advocated and high average milk yields were obtained. Many 2,000-gallon cows were produced, and one heifer holds the British record with 23,560 lb. of milk produced with her first calf. The herd was visited annually in the summer months by parties of farmers totalling some 2,000 persons each year.

As a result of all this work dairy herd rationing receives nowadays perhaps more attention in County Agricultural Education than any other single subject, and the correct rationing of his herd, and even of his individual cows, receives a farmer's enlightened attention, while the subject has become a general topic of conversation in farming circles—a sure indication that knowledge is increasing and being passed on.

Striking evidence of the extent to which the principles of scientific rationing are being adopted was furnished by the replies received in answer to a circular letter that was sent in 1930 to 40 owners of 2,000-gallon cows. 34 replies were received; 27 of them stated that the system of rationing advocated was being followed, while the other 7 were carrying out various modified forms of the system.

A falling off in the use of chaff cutters, reduction of roots consumed, and savings in hay fed, are all signs of the successful advocacy of the system, as also is the farmer's demand that proprietary foods shall be properly balanced and the consequent attention that the manufacturer now gives to the matter.

**Management of Cows for High Milk Yields*: Robert Boutflour, M.Sc., Harper Adams Agricultural College Dairy Husbandry Bulletin No. 1, November, 1926. 1s.

In recent years most of the winning cows at the premier agricultural shows, including Royal Show winners of the past four years, have been scientifically rationed in accordance with the principles laid down by Mr. Boutflour.

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It is estimated that 80 to 90 per cent. of the feathers required by manufacturers in this country are imported from overseas,

**The Feather
Industry**

the bulk coming from China, Japan, America, Russia and other countries. There is no doubt that the disposal of feathers, as a by-product of the poultry industry, has been neglected in the past, and the imposition of a tariff should now provide the home producer with a suitable opportunity of competing with the foreigner. British manufacturers are prepared to accept large quantities of feathers should a regular supply be available, but the merchant will not concern himself with small consignments, and this is the reason why he relies largely for his requirements on foreign supplies that arrive in the raw state in regular shiploads. The price paid for imported feathers is, no doubt, lower than that paid at home, and it is advisable, therefore, for poultry producers to co-operate, and so facilitate the handling of large quantities of feathers and maintain a continuity of supplies. There is a market for both white and coloured feathers, but those from the tail and wings should be excluded. Better prices are obtained when the feathers are graded according to size and texture and the colours kept separate. It is important to store the feathers in a dry shed before dispatch in order to rid them of as much moisture as possible and to prevent rotting. On removal by the merchant they are cleaned, graded into feathers and down, and then undergo a process of purification. When it is realized that the value of the feathers imported into this country from foreign sources amounted, in 1931, to half-a-million pounds, the necessity for giving proper care to the disposal of feathers produced in this country will be apparent.

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"Aims and Work.—The management of the Station, which is the official one for England and Wales, was entrusted to the Institute by the Ministry of Agriculture in 1921, and it has since that year formed an integral part of the Institute. Its aim is to improve the

* Extracted from Twelfth Report of the National Institute of Agricultural Botany, Cambridge, 1930-31.

quality of agricultural seeds by testing samples and issuing reports thereon both to enable sellers to comply with the Seeds Act, 1920, and for the information of purchasers and farmers who grow their own seed."

"The work of the Station consists primarily in testing samples received from seed merchants, farmers and Government Departments, and for investigations, in numbers which, during the past few seasons, have varied between 25,000 and 30,000 a year. Samples are also examined for certain seed-borne diseases, and an active part is played in the English Wild White Clover Certification Scheme. The principal problems arising from seed testing are investigated, and the accumulated experience of the Station is placed at the disposal of all who handle seeds."

"*Progress in 1930-31.*—The harvest conditions of 1930 left little doubt that there would be a big demand for the Station's services in the following twelve months. Anticipations were fully realized, for 26,862 samples were received in the season ended July 31, 1931. Another 3,080 samples were tested for purposes of investigation, and the total was thus 29,942. This has only once been exceeded and is only 51 less than the record total of 29,993 tested in 1927-28. The number of routine samples, 26,862, is in fact the highest in the history of the Station, the previous best being 26,583 in 1927-28. The Council feel much satisfaction with this striking proof of the usefulness of the Station, and, though seasonal and trade conditions are bound to cause fluctuation in the number of samples, they know that the high standard of the work will retain the confidence of the public. These results are due primarily to the efficiency of the Staff, for the Station is not lavishly equipped; it has, however, been the consistent policy of recent years to take steps whenever funds permitted to improve laboratory and office arrangements and to fill the gaps in equipment with a view to reaching the standard that is necessary for a station of international repute. The experiments previously carried out with softened water have led during the past year to the installation of a water-softening plant of the base-exchange type with a synthetic mineral filling. This is working satisfactorily and will not only save labour, gas and electric current, but also prolong the lives of the Copenhagen tanks. Another improvement arising from the study of delayed germination and methods devised at the Station to overcome this difficulty is the installation of a cold storage incubator; many inquiries were made to insure that the right kind should be chosen. This was ready for use at the end of 1931; it will

make the testing of slow-germinating cereals as well as of certain other seeds very much easier and will do away with the risks which the Station has hitherto been forced to run."

"As knowledge of the adaptation of seeds grows, it becomes increasingly important to determine origin correctly, and a good deal of work has been done with red clover with a view to detecting any foreign or blended seed which might possibly be offered as English. Impurities found in cereals of foreign origin have been another subject for study, and many species of seeds found as impurities in commercial samples are being grown for identification. Questions connected with germination are often difficult to answer. The work on delayed germination, for instance, is being continued, and abnormal and defective growths require constant study; the various species of *Brassica* have received particular attention from this point of view in the past year. Information continues to be accumulated about loss of vitality, and the chance offered by the bad harvest of 1930 was taken to study this in the case of weathered seed. Work has also been done in the field and laboratory on commercial species of *Festuca* and *Agrostis*, and among seed-borne diseases special attention has been paid to *Helminthosporium* in barley and oats, and the effect on this of the fungicidal dusts which are now being used in increasing quantities."

"The International Congress took place at Wageningen from July 13 to 18, 1931. It was attended by the Chief Officer and drew representatives from thirty-nine countries. Many European seedsmen were also present. Apart from the technical papers the principal business was the discussion and formulation of seed testing rules and certificates for international trading. They have been referred to the International Seed Dealers' Association which meets in Berlin in 1932. They will in any case be optional. The Chief Officer has been a member of the Executive Committee of the International Seed Testing Association from the time of its formation in 1924, and he was re-elected a member at this Congress."

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THE Minister of Agriculture and Fisheries announces that, for the purpose of the redemption of tithe rentcharge for which application is made after March 8,

Redemption of 1932, until further notice, the compensation for redemption will be twenty-three times the net amount of the tithe rentcharge, after the deductions prescribed by the Tithe Acts, 1918 to 1925, have been made.

APPLICATIONS are invited for the under-mentioned scholarships :—

Scholarships for the Sons and Daughters of Agricultural Workmen and Others 5 *Senior Scholarships* tenable at agricultural colleges or university departments of agriculture for diploma or degree courses in agriculture.

130 *Junior Scholarships* (including 10 Extended Junior awards for those who have already held Junior scholarships) tenable at farm institutes for courses in agriculture, horticulture, dairying or poultry husbandry.

Candidates for scholarships must be :—

- (a) sons or daughters of agricultural workmen or of working bailiffs and smallholders whose means are comparable with those of agricultural workmen ; or
- (b) *bona fide* workers in agriculture ; or
- (c) sons or daughters of rural workers whose means and method of livelihood are comparable with those of agricultural workmen.

The scholarships cover the whole cost of instruction and maintenance while the student is at the institution. Selection is by interview and not by written examination, but candidates must be able to satisfy the Selection Committee that they are in a position to derive educational benefit from the proposed courses of instruction and that they intend to take up an agricultural pursuit after receiving the training covered by the award.

Further information and forms of application can be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1, or from the offices of county councils. The latest date for receiving applications is April 30, 1932.

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THE Board of Education has just issued a memorandum* with the object of stimulating a wider interest in the instructional possibilities of museums and galleries, and encouraging their more effective

**Museums and
Schools**

use for educational purposes. The memorandum describes typical methods by which these institutions have already, in some places, been brought into fruitful co-operation with the public educational system. The difficulties that exist are indicated, and useful suggestions are put forward for practicable lines of advance.

* *Memorandum on the Possibility of Increased Co-operation between Public Museums and Public Educational Institutions* (Board of Education Educational Pamphlets, No. 87), obtainable from His Majesty's Stationery Office, Adastral House, W.C. 2, price 9d.

At the present time, special attention is being directed to the circulation of suitable museum specimens to rural schools. An exhibition of such specimens, staged by the Museums Association with the assistance of the Carnegie Trustees, has done much to arouse interest in this important branch of activity. A museum of commercial commodities now forms a regular feature of certain technical institutes and similar educational establishments. The curators of some public museums make a practice of advising teachers in such matters as the identification of local specimens and the selection of illustrations. Cases of exhibits may be requisitioned on loan in certain counties, the cost of transport being defrayed by the Local Authority. Some museums regularly send circulars to schools in the vicinity, giving notes on new acquisitions, suggestions for museum lessons, and lists of exhibits, lantern slides and other material available for circulation. Regional surveys, in which the children search out and record all they can discover in regard to local occupations and resources, are being undertaken in many places, and serve as a valuable auxiliary to the school museum. By these and similar means suggested in the pamphlet, it is hoped that the museums will be more fully utilized for the educational work of the nation.

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THE undermentioned Certificate and Report, issued by the Ministry in respect of the performance, under test, of a mowing machine, have been printed and published together in pamphlet form. Copies of the

Agricultural Machinery Testing Committee pamphlet can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 2d.

net, post free 2½d.

No. 36. The Albion H.R. Right-Hand Oil Bath Mowing Machine. Submitted for test by the Manufacturers, Messrs. Harrison, McGregor & Co., Ltd., Leigh, Lancashire.

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THE Ministry is informed by Imperial Fruit Show, Ltd., that it has been arranged to hold the

Imperial Fruit Show, 1932 Twelfth Annual Imperial Fruit Show at the Bingley Hall, Birmingham, from Friday, October 21, to Saturday, October

29, 1932.

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BOVINE TUBERCULOSIS AND ITS RELATION TO THE DISEASE IN MAN

S. H. GAIGER, F.R.C.V.S.,

Professor of Veterinary Pathology, University of Liverpool.

THIS subject is one of peculiar difficulty, since there are so many interests affected and just as many different points of view. There is the point of view of the agriculturist who is continually asking the public to drink more milk; there is the point of view of the general public who are convinced that there is no more perfect food than milk, but are doubtful about drinking more of it without some assurance that it is free of all danger. Then there is the point of view of the surgeons, who are constantly encountering cases of surgical tuberculosis in children; also that of the politician who, when asked to undertake measures against bovine tuberculosis and tuberculous milk, realizes that to carry out the proposals would entail the expenditure of large sums of money, which the country, in present circumstances, would have difficulty in providing.

If tuberculosis were a disease of the nature of Foot-and-Mouth disease, which can, almost literally, be seen spreading from animal to animal, active measures against it would have been undertaken long ago. The fact is, however, that the spread of tuberculosis is slow and insidious; one can neither see animals becoming infected nor tell in the majority of cases, without undertaking somewhat laborious tests, whether or not the animal harbours infection.

The disease is caused by a microbe spoken of as the tubercle bacillus. This germ is to be found in all infected animals in the lesions that are characteristic of the disease. The bacillus does not grow and multiply outside the body of the living animal, though it may live for a certain length of time upon infected premises and pastures. It follows that every new case of infection arises from direct contact with an infected animal, or from contact with premises or pastures upon which infected animals have fairly recently been present.

It may be desirable to make clear what is meant by the expressions "closed" and "open" tuberculosis. The term "closed" tuberculosis is used to denote that while a cow, for example, may be infected with tuberculosis, the lesions, which may be in the liver, lungs or some other organs, are enclosed in a capsule in such a way as to prevent the exit of tubercle bacilli from that lesion. In other words, the body has succeeded in localizing the area of infection by throwing

a casing of fibrous tissue round about it. Animals with lesions such as these are of no danger in spreading infection to their fellows so long as these lesions remain closed. By "open" tuberculosis is meant infection of some part of the body from which there is access to the exterior through natural channels, for example, a cow may have tuberculosis of the lungs with cavities in these organs from which infection is coughed-up on the walls, mangers, etc., or swallowed, after being coughed-up into the throat, gaining exit from the body in the dung. The intestines themselves may be infected with tuberculous ulceration and large quantities of tubercle bacilli may be passed out in the dung; or the womb may be infected and tubercle bacilli passed to the exterior in discharge; or the mammary gland may be infected and tubercle bacilli may be passed to the exterior in the milk. There is really no hard-and-fast distinction as between "closed" and "open" tuberculosis, and there is no method of ordinary clinical examination that can determine whether or not an infected animal is passing bacilli to the exterior. Proof can only be obtained after careful laboratory examination of dung, milk, sputum, etc. We must also bear in mind that "closed" tuberculosis cases may, under the stress of calving and milk production, become "open" tuberculosis, the "closed" lesion breaking through its capsule and infecting other parts of the cow's internal organs.

When are tubercle bacilli present in cow's milk? It may be accepted as definitely proved that tubercle bacilli are always present in the milk of a cow suffering from tuberculosis of the udder; that tubercle bacilli are often present in the milk of a cow showing general clinical symptoms of tuberculosis, such as cough, emaciation, etc.; that tubercle bacilli *may be* present in the milk of a cow whose udder shows no clinical signs of disease; and that tubercle bacilli are *not usually* present in the milk of a cow whose only sign of tuberculosis is that she is a reactor to the tuberculin test.

. One sees various estimates of the extent of the danger to human beings from tuberculous milk. It may be accepted as a fairly accurate estimate that tuberculosis is present in Britain in 30 to 40 per cent. of cows. The comment on this figure usually is that only 0·2 per cent. of milking cows show tuberculosis of the udder, but from the foregoing it will be realized that cows showing general clinical symptoms of the disease may also give tuberculous milk. If one takes the figures of cows and heifers seized under the Tuberculosis

Order* (see the Official Report) one finds that 2·5 per cent. (or 25 per 1,000) of the bovine animals on the premises, or 6·3 per cent. (or 63 per 1,000) of the bovine animals actually examined, come within the scope of the Order. The number affected with tuberculosis of the udder or giving tuberculous milk is given as "only 0·57 per cent. of the cows and heifers on premises inspected," but the figures work out at 1·3 per cent. of the cows and heifers examined, and it is only these one has any right to take cognizance of. Even this figure of 13 per 1,000 is probably very much of an under-estimate, as probably many clinical cases are seized as such without their milk being examined, when such an examination would have brought them into the tuberculous milk category. These figures only apply to premises and animals examined and not to the whole country, but there are figures which show that approximately 10 per cent. of our farms are giving tuberculous milk. The percentage of samples of market milk found to contain tubercle bacilli is variously given as from 2 to 16 per cent. in various cities in the country, but it must be remembered that such samples do not give us an indication of the amount of tuberculosis on the farms where the milk came from. To get an idea of this, samples must be collected from the mixed milks before they leave the farm. Of some 1,300 such farm samples, tested in my department during the last 12 months, almost exactly 8 per cent. proved to be tuberculous. It must be remembered that the tuberculous milk from one cow may infect the milk of a large number of healthy cows with which it is mixed, and it is probable that no amount of dilution of the tuberculous milk, which takes place in this way in practice, is sufficient to render the whole harmless; rather may it be accepted that the larger the quantity of milk with which a tuberculous milk is mixed, the more widespread is the danger created.

In children, the bovine tubercle bacillus sets up well-recognized types of disease, mostly tuberculous glands in the neck and abdomen, tuberculous bones and joints, and tuberculosis of the spinal cord. The percentage of such cases, found to be due to the bovine tubercle bacillus, varies for different parts of the country, and also varies with the age of the children examined. It has been estimated that

* An Order that deals with cows affected with tuberculosis of the udder, or giving tuberculous milk, or with tuberculous emaciation, or with a chronic cough and definite clinical signs of tuberculosis.

in children in England, under five years of age, 33 per cent. of cases of tuberculosis are due to infection from cows' milk, and, of cases of tuberculosis in children between the ages of five and ten, 24 per cent. are caused by the bovine tubercle bacillus. In Scotland, the figures have been found to be higher, and of gland, bone and joint cases in children under five years of age roughly 80 to 90 per cent. are caused by the bovine tubercle bacillus. It has recently been estimated that 5,000 fresh cases of bovine tuberculosis originate in children every year in this country and there occur annually from 2,000 to 3,000 deaths. Over and above the deaths, one has to remember the considerable number of non-fatal infections in children which disfigure and cripple, sometimes for life. It has been claimed that the drinking of tuberculous milk by children may be the means of giving them an immunity in after life against infection with human tuberculosis. The only evidence in support of this belief, held only by a few, is that it has been found that children, who have suffered from tuberculous neck glands when they were young, have shown less susceptibility to human tuberculosis when they became adults. It would surely be a crude method of protecting adults to suggest that children should drink tuberculous milk to achieve this end, when by so doing they render themselves just as likely to contract a fatal infection, or be crippled for life, as to be rendered immune; even supposing it were possible to immunize children against human tuberculosis, by feeding them on the bovine tubercle bacillus, one could find a much more accurate method of dosage in vaccines, made from cultures prepared in the laboratory, than from unknown doses taken in with tuberculous milk.

The question is often asked whether one can really say beyond question that cases of tuberculosis in children have arisen from infection from cows' milk—in other words, when material from an infected child is examined, have we a reliable means of examination from which it can definitely be said that the tubercle bacillus in that material is of bovine or human origin? It may be accepted that there is no reason whatsoever to doubt the ability of scientists to distinguish between the bovine, human and avian types of tubercle bacillus. There are certain definite characteristics that distinguish these types by which one can say, quite definitely in the majority of instances, whether a particular infection arose from a bovine or a human source. Over and above this, there are many cases of tuberculosis in children that have

been definitely traced to their drinking the milk from a farm on which cows have been found with tuberculous udders.

The cost to the country of bovine tuberculosis in cattle is enormous. A meeting of agriculturists does not require to be told of the losses that result from the presence of the disease in bovines. As regards children, it has been estimated that cases of tuberculosis in children cost the country £400 each to effect what is often only a partial cure. Apart from the cost in lives, there is the cost of disability in the individuals attacked, the cost of sanatorium treatment, the cost of administration of the Tuberculosis and other Orders, and so forth.

Is there a remedy for the position as defined? I have been asked repeatedly by agriculturists of experience whether there is anything to indicate that bovine tuberculosis is a disease that will die a natural death. Apparently, what underlies this thought are the published figures relating to the incidence of human tuberculosis as a whole in this country, since these figures show a decline and an increasingly rapid annual decline in the human death-rate. There is, however, nothing to show that bovine tuberculosis is getting any less in Britain; the probability is that the percentage of cases is increasing. The measures that are now in operation as affecting bovine tuberculosis in this country are those within the province of the Tuberculosis Order, 1925, the Milk and Dairies Act, 1915, Milk and Dairies Order, 1926, and the Milk (Special Designations) Order, 1923. Amongst other things, these Acts and Orders collectively provide for the seizure of animals with tuberculous udders and those showing clinical symptoms of tuberculosis, for routine veterinary inspection of dairy herds, for improved hygiene in byres, etc., and for the encouragement of those who wish to build up tubercle-free herds.

Whether these provisions are having any effect in reducing the incidence of bovine tuberculosis is very much open to question. It seems as though the provisions of the Tuberculosis Order ought to result in a reduction in the amount of tuberculous milk on the market, since the animals seized do not go on supplying tuberculous milk for consumption for quite so long a period as they would if the Tuberculosis Order were not in operation. It has been found that the number of animals seized under the Tuberculosis Order shows no tendency to diminish from year to year, as, on first thought, one might be led to expect. The reason for this is that the 30 to 40 per cent. of animals affected with tuberculosis already men-

tioned provide an almost inexhaustible reservoir from which year by year tuberculous udders and clinical cases are provided for seizure under the Order. The figure of 30 to 40 per cent. for all types of cases is, of course, kept up by fresh infection of healthy bovine animals. Veterinary inspection of dairy herds, when local authorities allow it to be adequately carried out, is undoubtedly a valuable means of detecting dangerous animals in a herd, provided this inspection goes along with the laboratory examination of milk samples. The best results have been obtained where the veterinary inspector is in a position, himself, to carry out microscopical examinations of the milk samples which he has collected from cows he has himself suspected. Veterinary inspection has this further advantage that it helps to educate the agriculturist to the dangers of bovine tuberculosis and assists him to understand what is meant by improved hygienic methods. At the present time, out of some 350,000 herds in England and Wales, fewer than four hundred are regularly tuberculin-tested.

There is hardly any reason to doubt that the methods in vogue at the present time are not bringing us with excessive speed towards the goal of eradicating bovine tuberculosis. There is more than a little justification for the belief that we are at present working from the wrong end of the problem, that we are only alleviating where we should be preventing by getting at the root of the question.

When one discusses eradication with those who consider it impracticable, one is usually confronted with enormous figures showing the cost of even a single tuberculin test of all the bovine animals in the country, but those who believe that a beginning might be made in the work of eradication do not suggest that there should be wholesale testing with tuberculin in this fashion. The scheme put forward by the National Veterinary Medical Association simply provides that, with Government help, we push on with the establishment of tubercle-free herds (a better term than tuberculin-tested herds), in suitable parts of the country, the object being the eventual establishment of tubercle-free areas which shall be of ever-widening extent. It would probably be found that an eradication scheme would have to provide for the establishment of tubercle-free farms from which tubercle-free stock could be provided to those coming into the scheme. The opinion is held by many that we shall never get much further forward along the lines of eradication until a Central Tuberculosis Eradication Organization is established whose

sole time and thought shall be given to the problem. If the organization is to be a division, as I think it should, of the Veterinary Service of the Ministry of Agriculture, it should be a special section of the Service devoted solely to the work of eradication.

Pasteurization of milk is coming into vogue to an ever-increasing extent as a means of providing better keeping-qualities for the milk on its way from the farms to the town consumer. When pasteurization is properly carried out the temperature of 145° F. for half-an-hour is sufficient to destroy tubercle bacilli present in the milk. In using the words "properly carried out," one means pasteurization by some process that will ensure that the whole of the milk reaches the temperature stated and for the time stated. Milk treated in this way is not appreciably altered in appearance or in nutritive qualities, but milk will not stand a temperature more than a few degrees higher than the temperature given without being materially altered in appearance and nutritive qualities. It follows that if pasteurization is to be practicable and effective it must be most efficiently carried out. Pasteurization affords us a means of reducing the danger to children from tuberculous milk, and figures are available from certain cities in America proving this to be the case. Pasteurization, however, does nothing to help towards the eradication of bovine tuberculosis.

Sooner or later an eradication campaign will have to be commenced, and, taking everything into consideration, in the light of present-day knowledge, no good purpose is served by delay.

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IMPROVEMENT OF PASTURES

[Certain pasture investigations have been carried out at 14 centres in Great Britain during the seasons 1928-31 by the Pasture Sub-Committee of the Advisory Committee on Agricultural Science. The following Report of the Sub-Committee has now been presented to the Development Commissioners.]

REPORT

To the Development Commissioners

GENTLEMEN,

We have the honour to present to you the Report on the work which has been carried out by the Pasture Sub-Committee since its appointment.

We should at the same time like to record our indebtedness to Mr. W. Godden for the very considerable amount of work he has done in analysing samples and in preparing the draft of the Report for which he was mainly responsible and without which the presentation of the results of our work would have been impossible.

The investigations, the results of which are outlined below, have been carried out under the guidance of a Sub-Committee set up in 1927 by a Committee of the Development Commission. Its task was as follows :—

“The Committee was requested to survey the large amount of work on pastures which had been published, to formulate the general conclusions to which this work led, and to decide the lines on which future work should proceed with the greatest prospect of fostering knowledge of pasture management.”

The state of knowledge in respect of grass land in 1927 and the directions in which further investigations should be prosecuted were adequately dealt with by a series of papers on grassland problems published by the Ministry of Agriculture and Fisheries in 1928. (Miscellaneous Publications No. 60.)

It is with the work conducted in accordance with the last part of the terms of reference that we are here concerned.

Introduction.—Work on pasture grass, as distinct from hay, had been carried out in recent years at Aberdeen, Aberystwyth and Cambridge, each centre dealing with a particular aspect of the problem.

The Aberdeen work had shown conclusively that the pasture grass of certain districts, notably hill pastures, might

be seriously deficient in certain mineral constituents, more particularly calcium, phosphorus and chlorine. Such deficiencies had been shown to produce definite symptoms of malnutrition and often a higher incidence of disease. Methods of correcting such deficiencies were and still are under investigation.

The Aberystwyth work had been in the direction of improving the nutritive value of pastures by improvement in the type of herbage. The results of this work suggested that it might be possible to introduce new varieties of pasture plants (1) yielding more leaf and less stem, (2) producing growth at varying seasons.

At Cambridge, where investigations into different systems of cutting or grazing had been examined, it had been shown that pasture grass if cut or grazed at an early stage of growth contains, on the dry matter basis, 65 to 70 per cent. of starch equivalent including about 20 per cent. of digestible protein, and that this does not appear to depend upon botanical composition. These conclusions were supported by the work on rotational grazing, carried out at numerous centres.

Present Investigation.—The main purpose of the first year's work (season 1928) was to obtain yield curves from as large a number as possible of different types of pasture typical of their district and then in subsequent seasons to ascertain the effect of manurial treatment in increasing the productivity of these pastures, and spreading the produce more evenly over the grazing season.

Season 1928.—A number of centres in England and Wales and two centres in Scotland were selected.

At each centre plots 6 ft. \times 6 ft. were chosen as representative as possible of the whole pasture and fenced off. The herbage was cut with shears on March 31 and this date marked the start of the experiment proper. No manures were applied, but the plots were cut at three-weekly intervals throughout the season. At each cutting the total green weight and dry weight per plot were determined. Wherever possible, rainfall figures and sunshine records, as well as any other meteorological data available, were obtained for each centre throughout the season.

Mr. W. Davies, of the Welsh Plant Breeding Station, visited the English and Welsh centres during August and submitted a detailed report on the botanical composition of the pastures.

He used a method based on tiller counts for each species, and as a result of his survey divided the pastures under experiment into seven classes. This classification was based partly upon general impressions obtained in the fields and partly upon the carrying capacity as estimated in consultation with the farmer concerned. Class 1 included pastures of highest reputation, while Classes 2 to 5 graded off to poorer grassland types. The downland plot (Marlborough, Wilts) and the recently seeded pastures at Aberystwyth were placed in separate classes, 6 and 7, respectively. The two Scottish centres were surveyed by the late Dr. W. G. Smith.

The data for the botanical composition of the different English and Welsh swards, as arrived at by Mr. Davies, are set out in Table I and in Table II the results are averaged by him for the several classes into which he grouped the pastures under investigation. The species are dealt with under three headings, classified according to their potential values as pasture plants, such values being based upon a knowledge of the agronomic behaviour of the species, and upon the herbage work conducted at Aberystwyth and elsewhere.

TABLE II.—TO SHOW THE AVERAGE FREQUENCY OF "SUPERIOR SPECIES," "INFERIOR GRASSES" AND OTHER PLANTS IN THE PASTURE CLASSES 1 TO 7

	1	2	3	4	5	6	7
"Superior species" ..	73.3	46.6	32.8	26.5	—	6.5	49.0
"Inferior grasses" ..	16.0	41.8	63.2	67.0	92.3	61.0	22.5
All other species ..	10.7	11.6	4.0	6.5	7.7	32.5	28.5
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

It will be noted that in passing from Class 1 to Class 5, *i.e.*, in descending order of merit, the average frequency of the "superior species" decreases while the aggregate amount of the "inferior grasses" makes a corresponding increase. Further, over the wide range of conditions of these five Classes, "all other species" never contribute more than 12 per cent. of the total herbage.

Table III shows the total yields per acre in pounds of dry matter for the different centres over the grazing season together with the dates of first and last cuttings and the rainfall between those dates. The yields range from 374 lb. per acre on the Wiltshire Downs (rainfall 8.7 in.) to 7,948 lb. per acre on the Anglesey Fattening Pasture at Lledwigan (rain-

TABLE I.—SHOWING: (1) PERCENTAGE FREQUENCY OF TILERS OF EACH SPECIES
(2) PERCENTAGE MOSS COVERED AND BARE GROUND.

Centre	Romney Marsh	Lincoln Marsh	Rease-heath, Cheshire	Lled-wigan, Anglesey	Norfolk	Essex	Dorset Water-Meadow	Shrop-shire	York-shire Millstone Grit	Wilt-shire Down Land	Aberystwyth
Class No.	1	1	2	2	2	3	3	4	5	6	7
Perennial rye-grass ..	62.5	36.5	31.0	29.0	27.0	10.5	4.5	Trace	—	—	8.5
Rough-stalked meadow grass ..	15.0	15.5	2.0	8.0	21.5	3.5	31.0	0.5	—	—	20.5
Crested dogtail ..	6.5	2.0	13.0	10.5	—	9.5	—	2.0	—	—	1.5
Wild white clover ..	2.0	6.5	19.0	11.0	8.0	6.5	—	Trace	—	3.0	18.5
Bent grass ..	11.5	12.5	23.5	14.0	34.5	58.5	32.5	59.5	91.5	Trace	4.5
Yorkshire fog ..	—	8.0	7.0	15.5	0.5	8.0	27.5	8.5	—	5.5	0.5
Fine leaved fescue ..	Trace	—	—	6.5	2.0	—	—	23.0	2.0	55.5	17.5
Cocksfoot ..	—	13.5	—	2.5	—	3.0	—	—	Trace	—	5.5
Timothy ..	Trace	—	1.5	Trace	—	—	Trace	—	—	0.5	—
Meadow fescue ..	—	—	—	—	—	—	—	—	—	—	—
Field barley grass ..	2.5	—	—	—	—	—	—	—	—	—	—
Meadow foxtail ..	—	1.5	—	—	—	—	—	—	—	—	—
Golden oat grass ..	—	3.5	—	—	—	—	—	—	—	—	—
Smooth-stalked meadow grass ..	—	—	—	—	—	—	—	—	—	—	—
Perennial oat grass ..	—	—	—	0.5	1.0	—	—	2.0	1.5	2.5	—
Red clover ..	—	—	—	—	—	—	—	—	—	11.0	—
Tall fescue ..	—	—	—	—	—	—	Trace	—	—	2.0	1.0
Other plants ..	—	0.5	3.0	2.5	5.5	0.5	4.5	4.5	5.0	16.0	4.0
Total ..	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage ground covered by moss ..	—	6.0	0.5	16.5	—	Trace	—	4.0	—	4.0	5.5
Percentage of bare ground ..	14.0	23.0	14.5	20.0	21.0	20.5	9.5	30.5	53.0	11.0	12.5

TABLE III.—RAINFALL AND YIELD OF DRY MATTER (LB. PER ACRE) ON AN UNTREATED PLOT. SEASON 1928

Class No.	Centre	Rainfall, inches	Dates of first and last cutting	Yield of dry matter in lb. per acre
1	Lincoln (Marsh)	8.39	23/4/28-8/10/28	5,095
1	Romney Marsh	8.42	14/5/28-17/9/28	4,062
2	Reeseheath (Cheshire)	12.09	5/5/28-29/9/28	3,191
2	Norfolk	11.40	25/4/28-18/10/28	4,866
2	Lledwigan (Bangor)	20.47	24/4/28-8/10/28	7,948
3	Dorset Water-Meadow	10.36	21/4/28-6/10/28	3,428
3	Essex	9.08	14/5/28-6/10/28	1,425
4	Shropshire	11.71	23/4/28-8/10/28	1,016
5	Yorkshire	13.00	23/4/28-9/10/28	1,472
6	Wiltshire Downs*	8.70	2/6/28-2/10/28	374*
7	Aberystwyth†	25.80	21/4/28-27/10/28	2,519†
—	Edinburgh (Seafield)	19.73	27/4/28-10/10/28	4,206
—	Edinburgh (Broedshaw)	16.10	6/6/28-18/9/28	2,233

† Air-dry material.

* Only four cuts obtainable, two in June, one in August and one in October.

fall 20.5 in.). The average for all the centres is 3,172 lb. per acre. When due allowance is made for variation in rainfall it will be seen that, in general, Mr. Davies' classification arranges the centres in their order of yield. The one marked exception is Lledwigan and there the rainfall was exceptionally high as compared with the other centres.

It is not possible to publish the figures for each individual cutting at each centre, but it may be indicated that, at the two centres in class 1, namely, Lincoln and Romney Marsh, both on marsh land, there was a fairly steady falling off in dry matter yield throughout the season which was not checked by a relatively heavy rainfall in August. The most irregular yield curve was obtained from the Lledwigan pasture.

Season 1929.—For this season it was decided to extend the investigation to ascertain the effect of manurial treatment on the different types of pasture. For this purpose two new plots (each two yards square) were marked out at each centre, near to but not covering the plot used in 1928. One plot served as a control and received no manurial treatment, whilst the other received the following manurial treatment :—

5 tons of ground chalk	} Per acre, applied as early as possible in the year,
$\frac{1}{2}$ ton of superphosphate	
2 cwt. of sulphate of potash ..	

and an application in late February and again immediately after each three-weekly cut during the season of $\frac{1}{2}$ cwt. of sulphate of ammonia per acre.

The two plots were cut separately, and for each plot, as before, the yield of green and dry matter per acre at each cutting was determined and samples drawn for analysis. These samples were subsequently analysed at the Rowett Institute and figures obtained for the percentages of nitrogen, total and soluble ash, lime and phosphoric acid.

Results.—The yield data for dry matter and also for nitrogen are given in Table IV, along with the rainfall and dates of first and last cutting. The gain due to manuring is given both in pounds per acre and as a percentage of the yield from the control plot both for dry matter and nitrogen.

It is somewhat difficult for certain of the centres to compare the yields in 1929 with those in 1928 as the periods over which the cuttings were made during the two seasons were different. On the whole the total yields for the control plot are lower in the 1929 season, which was a somewhat drier

TABLE IV.—RAINFALL AND YIELDS OF DRY MATTER AND NITROGEN IN LB. PER ACRE ON THE CONTROL AND MANURED PLOTS
SEASON 1929

Centre	Rainfall	Dates of first and last cutting	Dry Matter			Nitrogen		
			Yield		Gain due to manuring	Yield		Gain due to manuring
			Control plot	Manured plot		Control plot	Manured plot	
			lb. per acre	lb. per acre	lb. per acre	lb. per acre	lb. per acre	Per cent.
Lincoln (Marsh)	6.49	24/4/29-10/10/29	2,419	3,645	1,226	68.1	115.6	47.5
Romney Marsh	12.30	26/4/29-19/11/29	3,297	4,495	1,198	96.8	142.4	45.6
Reaseheath (Cheshire)	15.10	14/5/29-8/10/29	1,945	3,535	1,590	62.8	124.3	61.5
Norfolk	10.72	30/4/29-25/10/29	3,406	4,449	1,043	104.2	137.0	32.8
Lledwigan (Bangor)	18.38	22/4/29-7/10/29	5,518	7,857	2,339	154.6	233.3	78.7
Dorset Water-Meadow	6.64	22/4/29-9/9/29	3,400	6,443	3,043	118.5	240.7	122.2
Essex	4.87	27/5/29-9/9/29	946	1,030	84	28.0	41.1	13.1
Shropshire	9.09	13/5/29-7/10/29	746	2,127	1,381	16.7	58.5	41.8
Yorkshire	13.26	22/4/29-9/10/29	1,696	3,065	1,369	54.5	110.3	55.8
Wiltshire Downs*	10.71	31/5/29-28/10/29	187	630	443	4.1	18.5	14.4
Aberystwyth	24.51	23/4/29-29/10/29	3,405	4,471	1,066	98.2	136.8	38.6
Rutland†	8.63	1/5/29-15/10/29	2,400	4,532	2,132	78.7	187.2	108.5
Edinburgh (Seafield)	11.83	24/5/29-1/10/29	5,183	7,142	1,959	163.3	228.8	65.5
Edinburgh (Broadshaw)	10.09	5/6/29-18/9/29	2,094	4,599	2,505	57.3	131.3	74.0

* Only three cuts were obtainable on the control plot against five on the manured plot.

† A new centre this season, a well-known fattening pasture.

season as indicated by the rainfall figures. The range of dry matter yield on the control plots in 1929 was from 187 lb. per acre on the Wiltshire Downs to 5,518 lb. per acre at Lledwigan, with an average of 2,617 lb. per acre for all the centres. The two extreme centres are the same as in the previous season, namely, the Wiltshire Downs and the Anglesey fattening pasture at Lledwigan.

When the yields at each cut were plotted the graphs did not reveal any marked effect of the manuring in smoothing out the yield curves, but it did in most cases accentuate the peaks where rises occur. The application of the fertilizers resulted in a very definite increase in the total bulk of the crop over the grazing season as measured by the total yield of dry matter per acre. The average of all the centres gave a gain of 58.3 per cent. (or 1,526 lb. per acre) over the control plot with a range of 8.8 per cent. at the Chelmsford centre to 231.9 per cent. on the Wiltshire Downs.

Not only was there this very marked increase in yield of dry matter, but there was an even more marked increase in the yield of protein per acre at every centre. The average of all the centres gives a gain of 72.3 per cent. (or 356 lb. crude protein per acre) for the manured plot over the control plot for the whole season with a range of 31.5 to 351 per cent. Although most of this increase was due to the increase in dry matter, there was at the same time an improvement in quality, in that the percentage increase of protein yield at each centre was higher than the percentage increase of dry matter.

Although determinations of the total and soluble ash as well as calcium and phosphorus were made, it is not proposed to discuss these results for this season as, owing to the dry season, the lime and superphosphate applied in the spring had not, in all cases, become incorporated into the soil. In at least half the cases there was undoubted contamination of the samples, and the presence of lime on the surface of the land at the end of the season was reported from two or three centres.

Season 1930.—The plots as laid down in 1929 were used during 1930. They received no further basic dressing, but, as in 1929, $\frac{1}{2}$ cwt. of sulphate of ammonia per acre was applied in late February and again after each three-weekly cut during the season. The rest of the procedure was exactly as in 1929.

Results.—Table V shows the total yields of dry matter and nitrogen for the season on the unmanured and manured

TABLE V.—RAINFALL AND YIELDS OF DRY MATTER AND NITROGEN IN LB. PER ACRE ON THE CONTROL AND MANURED PLOTS.
SEASON 1930.

Centre	Rainfall	Dates of first and last cutting	Dry Matter			Nitrogen			
			Yield		Gain due to manuring	Yield		Gain due to manuring	
			Control plot	Manured plot		Control plot	Manured plot		
					lb. per acre			lb. per acre	Per cent.
Lincoln (Marsh)	16.34	29/4/30-14/10/30	5,367	7,777	2,410	170.6	252.1	81.5	47.8
Romney Marsh	17.02	5/5/30-20/10/30	4,350	5,820	1,470	133.4	185.9	52.5	39.3
Reaseheath (Cheshire)	18.53	23/4/30-8/10/30	2,209	3,470	1,261	67.5	116.0	48.5	71.9
Lledwigan (Bangor)	17.78	22/4/30-6/10/30	6,027	7,535	1,508	143.9	193.5	49.6	34.5
Dorset Water-Meadow	13.40	8/4/30-23/9/30	5,551	7,358	1,807	196.3	289.9	93.6	47.7
Essex	13.20	28/4/30-13/10/30	2,928	3,076	148	92.4	102.5	10.1	10.9
Shropshire	15.97	13/5/30-7/10/30	1,566	2,930	1,364	39.3	84.5	45.2	115.0
Yorkshire	26.48	7/4/30-21/10/30	1,412	4,438	3,026	48.9	151.7	103.8	210.2
Wiltshire Downs*	13.40	25/4/30-10/10/30	283	1,485	1,202	7.5	47.8	40.3	537.3
Aberystwyth	25.97	22/4/30-28/10/30	2,199	3,239	1,040	63.8	96.5	32.7	51.2
Rutland	16.00	1/5/30-21/10/30	6,913	7,097	184	229.4	215.8	—	5.9
Edinburgh (Seasfield)	18.53	14/5/30-8/10/30	2,278	3,644	1,366	69.4	112.6	43.2	62.2
Edinburgh (Broadshaw)	16.25	3/6/30-7/10/30	1,756	4,387	2,631	46.1	125.8	79.7	172.9

*Only four cuts were obtainable on the control plot against eight on the manured plot.

TABLE VI.—YIELDS OF LIME (CaO) AND PHOSPHORIC ACID (P_2O_5) IN THE GRASS CUTTINGS IN LB. PER ACRE ON THE CONTROL AND MANURED PLOTS. SEASON 1930.

Centre	Lime (CaO)				Phosphoric Acid (P_2O_5)			
	Yield		Gain due to manuring		Yield		Gain due to manuring	
	Control plot	Manured plot	lb. per acre	Per cent.	Control plot	Manured plot	lb. per acre	Per cent.
Lincoln (Marsh) ..	37.0	96.9	59.9	161.9	lb. per acre	lb. per acre	31.0	40.5
Romney Marsh ..	49.3	69.9	20.6	41.8	76.4	107.4	17.6	32.7
Reasheath (Cheshire) ..	21.6	54.6	33.0	152.8	53.8	71.4	20.9	127.4
Lledwigan (Bangor) ..	71.2	137.0	65.8	92.4	16.4	37.3	17.0	42.7
Dorset Water-Meadow ..	70.2	102.5	32.3	45.9	39.8	56.8	40.6	84.2
Essex ..	27.7	35.6	7.9	28.5	48.2	88.8	3.7	12.1
Shropshire ..	26.7	41.7	15.0	56.2	30.6	34.3	14.0	94.6
Yorkshire ..	5.6	112.6	107.0	1,910.7	14.8	28.8	32.1	258.9
Wiltshire Downs ..	6.4	27.3	20.9	326.6	12.4	44.5	10.0	459.4
Aberystwyth, ..	27.6	47.3	19.7	71.4	2.2	12.2	14.3	70.1
Rutland ..	87.0	96.8	9.8	11.3	20.4	34.7	6.9	8.8
Edinburgh (Seafeld) ..	22.8	44.4	21.6	94.7	78.6	85.5	11.3	57.9
Edinburgh (Broadshaw) ..	14.6	56.8	42.2	289.0	19.5	30.8	26.4	227.6

plots, respectively, at each centre and other relevant information. Table VI gives similar figures for the yields of lime (CaO) and phosphoric acid (P_2O_5) obtained in the grass.

On the whole the total yields of dry matter on the control plots are somewhat higher than those for the seasons 1928 and 1929. At most of the centres season 1930 was wetter than either of the two preceding seasons and this extra rain may account for the differences in yield.

As in 1929 the application of the fertilizers had no marked effect on the shape of the yield curves. Again, there was a marked increase in the yield of dry matter from the manured plots as compared with that from the corresponding control plots. The average percentage gain for all the centres was 45.3 per cent. (or 1,494 lb. per acre) with a range of 2.7 per cent. at the Rutland Centre to 425 per cent. on the Wiltshire Downs plots. It is of interest to note the very marked effect of the fertilizers on the Wiltshire Downs grass. Whereas it was only possible to obtain four cuts on the control plot, eight cuts were made on the manured plot with total dry matter yields of 283 lb. and 1,485 lb. per acre respectively on each plot.

The increase in yield is again in nearly every case accompanied by an improvement in quality as measured by the nitrogen, lime and phosphoric acid content of the dry matter and the fact that the average percentage increases in yield per acre of these three constituents from the manured plot herbage as compared with the control plot herbage, namely, 50.8 per cent., 97.2 per cent. and 57.8 per cent., respectively, are all greater than the average percentage increase in yield of dry matter.

The most spectacular increase in lime content of the herbage due to the application of fertilizers (including chalk) was obtained on the Millstone Grit soil at Arthington Bank (Yorkshire, Leeds Centre), where the lime content of the season's dry matter on the completely manured plot was 2.54 per cent. as compared with 0.40 per cent. on the control plot. At the same time the yield of dry matter was rather more than trebled. On a third plot at this centre which received 10 tons of chalk in the spring of 1929 and no subsequent manuring the lime content of the season's dry matter was 3.20 per cent. At almost every centre the actual or percentage increase in yield of lime in the cuttings was greater than the actual or percentage increase in yield of phosphoric acid.

Taking all the centres and averaging we obtain an increase of 1,494 lb. of dry matter ; 320 lb. of crude protein (containing 51.2 lb. of nitrogen) ; 35.1 lb. of lime (CaO) and 18.9 lb. of phosphoric acid (P_2O_5) per acre in the second season as a result of the manurial treatment. The figures for dry matter and protein increase are in close agreement with the results recorded above for the 1929 season.

Season 1931.—The plots and procedure were as in 1930, except that, while the cuttings, as before, were made at three-weekly intervals, $\frac{1}{2}$ cwt. of sulphate of ammonia per acre was applied only at six-weekly intervals.

For the sake of brevity, the detailed figures are not published, but the results are in accord with those of the previous two years. Although there was still a marked increase in the yield of dry matter from the manured plots as compared with that from the corresponding control plots, the difference was not so large as in 1929 and 1930. The average percentage gain for all the centres was 30.8 per cent. (or 1,103 lb. per acre). In so far as the analyses have been completed the results show that again, at most of the centres, this increase in yield was accompanied by an increase in quality as measured by the nitrogen, lime and phosphoric acid content of the dry matter.

Summary.—The results show a wide range in the total yields of dry matter per acre obtained from the untreated plots at the different centres in any one season. There were also differences in the shape of the yield curves throughout the season for the different centres.

Variations were also noticeable in the yield of dry matter at each of the centres from season to season, these variations being reflected, to a certain extent, by the rainfall during each of the three seasons.

Whilst the application of the fertilizers had no marked influence on the shape of the yield curves either in 1929 or 1930, there was a very marked beneficial effect on the total yield of dry matter per acre throughout the season. An average increase for all the centres of 1,526 lb. per acre was obtained in 1929, of 1,494 lb. per acre in 1930, and 1,103 lb. per acre in 1931.

This increase in yield was accompanied by an improvement in quality as measured by an increase in the protein content of the dry matter in 1929, and increases in the protein, lime

and phosphoric acid content of the dry matter in 1930. and 1931.

We are, Gentlemen,

Your obedient Servants,

(Signed) J. A. HANLEY (Chairman).

W. GODDEN (Reporter to Committee).

R. G. HEDDLE.

J. B. ORR.

R. G. STAPLEDON.

H. E. WOODMAN.

(Signed) G. E. FUSSELL (Secretary).

February 10, 1932.

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THE IMPROVEMENT OF ROUGH AND HILL GRAZINGS

III.—SOWING SEEDS, CULTIVATION AND MANURING*

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★

THREE leading methods may be employed for the introduction of new species on the poorest grazings: (1) Seeds may be sown on the surface of the existing sward without the support of any mechanical treatment; (2) The sowing may be supported by various methods of mechanical treatment; and (3) The existing sward may be completely broken by ploughing.

Whichever process is adopted, there is much recent evidence to show that, on soils of very poor fertility and/or of an acid character, there is very little chance of seedlings becoming well established without the assistance of lime or manures.†

In connexion with the trials under review, evidence has been obtained in support of the results reported by Orr, who has shown that white clover can be successfully established on

* The previous articles appeared in the issues of this JOURNAL for February and March, 1932.

† See, for example:—

Orr, J.: *Grass and Hay Farming: an Economic Study*. Manchester Univ. Press, 1931.

Dawson, R. B., and Evans, T. W.: "The Establishment of Grasses on Very Acid Moorland." This JOURNAL, March, 1931, p. 1188.

Idem., "The Establishment of Grasses on Very Acid Moorland with a View to Turf Formation." *Jour. Board of Greenkeeping Research*, II., No. 5, 1931.

Stapledon, R. G.: *Crops and Plant Breeding*. Agricultural Research in 1930, Roy. Agric. Soc. of England.

certain types of rough grazings without mechanical cultivation, provided lime and/or phosphatic manures have been supplied in generous quantity and that the grazing is adequate. All our results, however, suggest that establishment is rendered much more rapid and very much more certain if supported by mechanical treatment, while, with proper "cultivation," the initial dressings of phosphatic manures need not be excessive. In this article, it is the threefold method of treatment—seeding, "cultivating," manuring—with which we are solely concerned.

The Experimental Centres.—The trials brought under review have been conducted at four chief centres:—

On the Foot Hills of Plymlyon (Captain Bennett Evans, Peithyll, Bow Street, Cardiganshire).—This is typical mountain land at an elevation of from 1,200 ft. to 1,400 ft. above sea level. Most of the area brought under experiment is dense *Molinia* pasture lying on peat. Captain Bennett Evans has actually disc-ploughed an area of about 40 acres, which was to lie fallow all the winter and be harrowed down and sown in the spring. A considerable area has also been "cultivated," and preliminary sowings were made in 1931.

Ponterwyd (Mr. Ll. Bebb, Blaendyffryn, Goginan).—This also is typical mountain land, chiefly under *Molinia*, *Nardus* and heather, lying at but little less than 1,000 ft. above sea level. A small area was ploughed, but by far the larger area was subjected to different methods of cultivation and sown in 1931.

Lletyevanhen (Mr. J. Davies).—This represents mountain and heath land at about 1,000 ft. The types of vegetation brought under experiment have been *Molinia* pasture and *Fescue-Agrostis* pasture. Here a strip of one harrow width has been taken right across the open hill (traversing different types of vegetation) for nearly a mile.

Cilmerly Park, Builth Wells (Mr. S. M. Bligh).—Mr. Bligh's experiments have been conducted on lower and enclosed land, partly on *Molinia* pasture and partly in wood clearings. Mr. Bligh has also ploughed and re-seeded fridd land,* lying at from 800 to 1,000 ft. above sea level.

Other Centres.—Results of the ploughing and re-seeding of fridd land are also available from various centres in

* In Wales, "fridd" is understood to mean land that is fenced and adjoins the open hill. Much of this land has been ploughed in the past, but has now reverted for the most part to *Fescue-Agrostis* pasture and is very largely covered with bracken.

Cardiganshire and from trials conducted by Mr. Moses Griffith in Merionethshire.

Pre-treatment.—Before “cultivating,” it is often wise to adopt a suitable pre-treatment. Two methods have been experimented with, namely, burning and heavy grazing. Under suitable conditions and when skilfully done, it is surprising what good burns can be effected on relatively scant vegetation consisting wholly of grass. Various intensities of grazing have been tested by resort to tethered sheep, and the areas variously treated will be cultivated and sown this spring.

The Implements Employed for Cultivating.—The Caterpillar tractor (10 h.p.) has been the motive power in connexion with all the work on the open hills. The scratching and tearing implements have been (1) Ransome’s “Baronet” disc harrow, a strong disc with a serrated cutting edge. If heavily weighted down, and especially during very wet weather, it has done excellent work even on some of the most densely matted vegetation. (2) The ordinary Martin cultivator; this implement tends to bring up the mat in large pieces, but with subsequent harrowing or discing good results have been obtained. (3) The Whakatane Harrows* and the “Perfect” Harrows† from New Zealand. These are strongly-tined implements that have done excellent work on the less dense mats, and have proved very efficient as followers of the disc or the Martin cultivator.

It should be added that it has not so far been possible to make any exhaustive test of the various implements on the market. The implements employed have worked sufficiently well for the purpose immediately in view, *i.e.*, to test the three-fold treatment—scratching, manuring, seeding.

Mr. Bligh has employed a novel and interesting method of “cultivation.” His aim, however, has been chiefly to level down the ground. He has drawn timbers—the trunks of trees of manageable size, wound round with wire-rigging rope—across his rough pastures. This dragging, as well as breaking down the rough vegetation, has brought varying amounts of soil to the surface, and over a considerable area (more particularly on the wetter fields, perhaps) has made a suitable preparation for seeds when supported by manures.

* Kindly presented to the Station by Mr. Alex Sutherland, of Whakatane, and Messrs. Wright, Stephenson & Co., Ltd., Wellington, New Zealand.

† Kindly presented to the Station by The Taranaki Manufacturing & Exchange Co., Rata Street, Inglewood, Taranaki, New Zealand.

The Seeds and Seed Rates.*—In all cases, the seeds employed have been seedsmen's cleanings sown at the rate of about 1 cwt. per acre. Yorkshire fog has been the chief grass species, and excellent seed has been obtained as "cleanings." Eminently satisfactory wild white and wild red clovers have also been procured as cleanings, and the same has been true of crested dogstail, rough-stalked meadow grass and indigenous rye-grass from old Kentish pastures. The seed sown was reinforced to some slight extent with cleanings of Montgomery red clover, and with the blowings from indigenous cocksfoot.

The Manures.—Ten different schemes of manuring were tested, the aim being to ascertain the minimum dressings that would ensure satisfactory seedling establishment and over-wintering. Lime (as ground lime) was tested in four amounts ranging from 1 cwt. per acre to 2 tons; basic slag was used alone at the rate of 1 cwt. and 5 cwt.; nitro-chalk was used alone at the rate of 5 cwt. The combinations tested were: 1 cwt. slag with 1 cwt. nitro-chalk; 2 cwt. slag with 2 cwt. nitro-chalk; 5 cwt. lime with 2 cwt. each of nitro-chalk and basic slag. In all, including the several centres, the number of plots (usually about 1-120th acre each) on which were tested the different methods of scratching and of manurial treatment, exceeded 500.

Discussion of Results: *Ploughing the Open Hill.*—Results are, of course, not yet available regarding the area on Plinlimmon disc-ploughed by Captain Bennett Evans. One strip was, however, harrowed down and sown soon after being ploughed, and on this strip the seeds have taken very well on the plots supported by proper manurial treatment.

A small area (in the main *Nardus-Molinia* pasture on shallow peat) was ploughed at Ponterwyd with an ordinary double-furrow (horse) plough harnessed behind the Caterpillar tractor. This was put up in comparatively shallow furrows. The "cleanings" were broadcast over the furrows early in May without any sort of harrowing or covering operations. On all the plots supported by adequate manuring, the York-

* It is to be understood that the seeds mentioned here were used for experimental purposes. The Regulations under the Seeds Act, 1920, expressly forbid the sowing, or sale for agricultural purposes, of seeds containing more than 5 per cent. of injurious weed seeds, these being defined as Docks and Sorrels, Yorkshire Fog, Soft Brome, the Crane's-bills, and Wild Carrot. None of the cleanings used, however, contained appreciable amounts of these injurious weeds except Yorkshire Fog, which, as employed, was practically pure.

shire fog established itself extraordinarily well—both on the crests and sides of the furrows and in the grooves between them, while, towards the autumn, white clover was seen to be establishing itself to a certain extent on the plots that had received lime or basic slag. The rapidity with which the Yorkshire fog grew on the plots where nitro-chalk was included in the manurial scheme was remarkable. Sheep were turned off and on until November. The ridge and furrow effect was largely obliterated by the late autumn and, from the point of view of economical sward-formation, it is doubtful if the area will need any further treatment. A factor favouring this rather unexpected result was, undoubtedly, the wet summer, assisted by the heavy night dews and mists experienced in the hills. This matter of heavy dews and mists is to be accounted a very important factor immensely favourable to the success of all schemes of improvement based on the surface sowing of seeds. In this connexion, it is well to emphasize that “hill” country stands at a decided advantage compared with “lowland” country; “damp” is probably second only to manures in importance.

*Ploughing of Ffridd Land.**—To discuss this question in detail is not within the scope of the present article. Plots sown with simple mixtures were, however, laid down in Merionethshire in 1927. The writer and Mr. Moses Griffith recently visited some of these areas, which are very striking.

The plots were heavily grazed from the outset, and are now a mass of wild white clover with crested dogstail and indigenous cocksfoot in strong evidence. Plots sown (1927) on similar land in Cardiganshire have shown to the great advantage of pedigree red fescue, and here, too, the pedigree indigenous cocksfoot is persisting remarkably well—the Danish cocksfoot having almost completely disappeared.

In Breconshire, last May, Mr. Bligh sowed out a large area (800-1,000 ft. above sea level) with mixtures in which wild white clover and indigenous cocksfoot predominated. With proper assistance from phosphatic manures, the take and establishment were entirely satisfactory, and during the late summer and autumn the field carried a large flock of sheep, all the evidence pointing to the fact that a really satisfactory sward has been assured. Success turns on four things in particular: good ploughing (the sod must be turned well over); heavy incremental grazing from the outset; applica-

* See footnote p. 37.

tion of manures at the time of sowing ; and sufficiently heavy seeding. The minimum sowing of wild white clover should be 2 lb. per acre, and 3 or even 4 lb. is not too much.* These mixtures should be put down with rape and Italian rye-grass, or without a nurse crop, and, generally, should be subjected to a first light grazing within about 12 weeks of sowing.

Scratching : The Effect of Manures.—No attempt can here be made to give a full account of the behaviour of all the plots under the various treatments. The point—indeed the crucial point—that needs to be brought out is the effect of the manures, for this has been the outstanding feature of the whole undertaking. The simple truth is that the various manurial treatments have given results of the same general character relative to each other at all the centres, and under all treatments—ploughing, discing, harrowing, cultivating alike. In the interest of brevity we shall, therefore, proceed—blatantly as it may seem, but with absolute justification—to discuss average figures for plant establishment in relation to the manurial treatments as such.

The main features of the results obtained are set out in Table I.

TABLE I.—TO SHOW THE EFFECT OF MANURES ON SEEDLING ESTABLISHMENT. COUNTS (SEEDLINGS PER $2\frac{1}{2}$ SQ. FT.) MADE THREE MONTHS AFTER SOWING. THE FIGURES REPRESENT AVERAGE RESULTS FROM A LARGE NUMBER OF REPLICATIONS AT SEVERAL CENTRES.

Treatments	Better grasses†	Yorkshire fog	Wild white and wild red clovers‡	Total seedlings
Plots 1-4 : Lime only	66	302	24	392
Plots 5-6 : Basic slag only.	60	303	33	396
Plots 7-9 : Basic slag and nitro-chalk . .	102	448	43	593
Plot 10 : Nitro-chalk alone	81	285	17	383
Plot 11 : No manures	33	218	3	254

† Perennial rye-grass, cocksfoot, rough-stalked meadow grass and crested dogtail.

‡ Chiefly white clover.

The chief point to be noted is the fact that the combination of basic slag with nitro-chalk has given very decidedly the best results. Not only has this been so to a marked degree

* A very good practice is to include in the mixture about 2 lb. of "pure" wild white clover per acre, and to supplement this with 2-3 lb. of carefully purchased wild white clover cleanings.

in respect of the better grasses, and of Yorkshire fog, but also in respect of the clovers. The benefit from added nitrogen has been greater than the figures indicate, for, on the with-nitrogen plots, grass and clover seedlings alike grew away faster and more robustly than on plots where nitrogen had been withheld. Lime by itself has not helped the clovers as much as has basic slag by itself, and neither lime alone nor basic slag alone has assisted the grasses to nearly the same extent as the combination of basic slag and nitro-chalk. Nitro-chalk by itself has apparently assisted the "better grasses" to some extent, but has not had any material influence on the clovers or Yorkshire fog. Regarding individual plots, the best results were obtained on those receiving 2 cwt. basic slag with 2 cwt. nitro-chalk; the addition of 5 cwt. of lime to this dressing would not appear to have had any very marked influence. On the whole the results were surprisingly good on the plots only receiving 1 cwt. basic slag with 1 cwt. nitro-chalk; in some instances, these were indistinguishable from those receiving the larger dressings.

The plots were kept under continual observation from the time of sowing. The grasses and clovers germinated as well on the untreated and least successful plots as on the most successful plots; failure in "establishment" is due not to impaired germination but to seedling casualties. Both germination and successful establishment are, however, long drawn out in the case of white clover. This is well shown by a comparison between counts made in June, two months after sowing, with those made in September, five months after sowing (see Table II).

TABLE II.—TO SHOW THE EFFECT OF VARIOUS MANURIAL TREATMENTS ON THE ESTABLISHMENT OF WILD WHITE CLOVER TWO MONTHS AND FIVE MONTHS AFTER SOWING. DATA FROM PONTERWYD. SEEDLINGS PER 2½ SQ. FT.

Treatment	June two months after sowing	September five months after sowing
Lime alone	11.1	16.1
Basic slag alone	12.1	33.3
Basic slag with nitro-chalk	12.5	38.3
No manures	1.0	0.3

The figures in the table again show the absolute necessity of manuring for clover establishment; that basic slag gives very much better results than lime; and that the addition of nitro-chalk to basic slag further assists clover establishment.

The following further important facts were brought out by critical observations made on all the plots at the several centres :—

(1) The clovers establish best from relatively early sowing dates (*e.g.*, first week in May); the grasses are less sensitive to date of sowing.

(2) The clovers make greater demands on moisture than do the grasses. In consequence the clovers must either be (*a*) properly covered with soil, that is to say, if an area is being scratched with the object of destroying the mat, it must be scratched almost to a condition of arable so that the seeds can be covered by further harrowing, or (*b*), sown on an area not sufficiently scratched to kill and remove the existing vegetation; the scratching must then rather serve to inoculate the seeds into the turf, to aerate the mat and help to disseminate the manures. The phosphatic manures and the moisture held in the turf combine to make conditions surprisingly favourable to clover establishment. When white clover seedlings are once established, the growing plants, helped by phosphatic manures, have a marked ability for eating into the mat and gaining ground rapidly at the expense of the poorer grasses.

(3) Sowing on a hard, burned surface without any scratching is unfavourable to clover establishment, despite the generous application of manures, although Yorkshire fog establishes fairly well, even under these conditions, when helped by manures.

(4) Potassic manures would seem further to assist the establishment of clovers, perhaps only to a slight extent in the case of wild white clover, but apparently to a remarkable extent in the case of wild red clover.

(5) Relative to each other, the clovers establish better on the "wetter" areas and the grasses on the "drier."

(6) Yorkshire fog is remarkable both for the rapidity of its establishment and for the speed with which it grows away under proper manurial treatment.

(7) Where North African phosphates have been employed instead of basic slag the best results have been obtained when these have been applied some time before sowing.

Practical Recommendations.—The evidence brought forward in these three articles, supported by further evidence that cannot be discussed here, and by long experience in connexion with rough and hill grazings, would seem to justify the following practical suggestions :—

(1) The areas for improvement should be carefully selected. They should be relatively sheltered, and such as are least likely to be covered with snow for long periods at a time, the point being that the "improved" areas will be of enormous value for winter keep rather than that excessive exposure renders improvement impracticable. The areas should also be selected with the object of simplifying additional fencing required.

(2) A scheme of improvement should be mapped out on the basis of a well-conceived yearly programme. On this

basis, certain areas, *e.g.*, a proportion of the area under *Molinia* pasture, should be pre-treated by manuring (phosphates with nitrogen) and heavy stocking for a period of years before they are "scratched" and sown.

(3) No matter what method is adopted relative to cultivation, seeds will not establish themselves to a point of economical significance unless supported by adequate manures, *e.g.*, by basic slag (2.5 cwt.) and nitro-chalk (1 cwt. or even less).

(4) Each type of pre-existing sward, each type of "mat" and each set of soil conditions will obviously call for its own, and to itself, most suitable treatment, so that the maximum benefit may be obtained at the minimum cost. Investigations have not proceeded far enough to justify an attempt to enunciate an explicit code of rules. Certain important generalizations can, however, be made.

(5) It is not necessary to plough for the successful introduction of wild white clover. The greatest need for ploughing is when desirable grass species are almost or entirely absent, *e.g.*, on a *Molinia* or *Nardus* pasture with very little sheep's fescue on it and practically no bent. On such areas to plough may well be a more economic proposition, in the long run, than to conduct some years of manurial and heavy grazing pre-treatment. Ploughing, of course, always carries the very important advantage that it becomes possible to introduce not only Yorkshire fog and bent, but also "better" grasses (*e.g.*, indigenous cocksfoot, indigenous red fescue and crested dogstail) with the greatest promise of success.*

(6) If an area is ploughed, it must be harrowed down to something like an "arable" condition so that clover seeds can be properly covered, if success is to be assured. The experimental evidence indicates that, if this is not possible, it would be desirable only to sow grasses in the first year and to "inoculate" clover seeds into the new grass sward in the second year—a procedure for which there is perhaps much to be said in any event.

(7) "Scratching" must be performed with a quite definite object. One may either set out to scratch to such a degree of intensity as practically to destroy the pre-existing vegetation and to "hack" the mat to pieces, or one may scratch

* As indicated in the footnote on p. 39, the actual sowing of seed containing more than 5 per cent. of Yorkshire Fog is expressly forbidden by the Regulations under the Seeds Act, 1920. Nevertheless, the experimental evidence of the great value of this so-called weed grass, under certain conditions and in certain situations, seems to be so pronounced that it may call for a reconsideration of the official prohibition of its use.

merely to aerate the mat, to assist in the dissemination of the manures and to inoculate seeds into the mat.

(8) If one sets out to destroy the mat and the pre-existing vegetation, one must be successful to the pitch of creating sufficiently "arable" conditions to cover the clover seeds properly with soil. If it is desired to introduce better grasses as well as white clover, this is the ideal method of procedure. The serrated disc harrow has been successful in creating these conditions on some soil-sward types.

(9) Provided the pre-existing vegetation is not reduced to insignificance, clovers establish almost to perfection on a relatively lightly scratched-manured mat when the moisture factor is adequate. In most instances, this is the best method of procedure when it is only required to establish clovers. Grasses cannot, however, be introduced to very great advantage unless the pre-existing sward has been very much thinned down, and a somewhat "earthy" seed bed created.

(10) Success, in the proper meaning of the word, will in no circumstances be achieved unless heavy and well-conceived incremental grazing accompanies all the treatments.

(Concluded)

ACKNOWLEDGMENTS.—In discussing a series of problems with a band of enthusiastic co-workers, it becomes almost impossible justly to apportion the various ideas that eventually crystallize in the form of a particular procedure. My first acquaintance with the tined harrow as a valuable implement on grass land was in connexion with a scheme of trials laid down by Mr. C. Bryner Jones (at the old College Farm at Aberystwyth) 19-20 years ago. My only contribution was to make a botanical analysis of the plots, and it has not been forgotten that harrowing plus slag had given very much better results than slag only.

My intimate association with Mr. Stanley M. Bligh (Cilmeri Park, Builth Wells) makes it quite impossible to segregate my own ideas from his, but I feel quite certain that to him I owe the idea of "cleanings" as a really sound scheme. It was as the outcome of some of his trials that I began to study seriously the whole question of cleanings.

I am in the same position with Captain G. L. Bennett Evans (Peithyll, Bow Street, Cardiganshire), whose idea it was to plough on Plynlymon, and who had the boldness to put his idea to the test.

Then there is the question of "inoculating" white clover into a sward with the help of heavy dressings of slag or lime: here I owe a great deal to discussions with Mr. John Orr, of Manchester, with whom we at Aberystwyth have been working in the closest association.

I first realized the significance of the Caterpillar tractor as the result of a quite casual conversation with Mr. Thompson Close, of the Ministry of Agriculture.

To apply small doses of complete manures to assist plant establishment was an idea that was growing up amongst my

colleagues and myself at the Plant Breeding Station, but the idea only took concrete form when I had seen Mr. R. B. Dawson's results with lime at Bingley and had had the opportunity of discussing the whole matter with him.

In so far as Director and staff of a research station are concerned—well, they just think as “one man,” and there is no more to be said.

My most grateful acknowledgments are, therefore, made to all those mentioned for their helpful ideas, while further thanks are due to Mr. Bligh and Captain Bennett Evans for their material assistance, which has made it possible to carry out the trials on a sufficiently large scale.

I am also indebted to Mr. J. Davies, of Lletyevanhen, and Mr. Ll. Bebb, of Blaendyffryn, Goginan, for placing land at our disposal and for help in various ways; and a special word of thanks is due to my colleague, Mr. M. T. Thomas, who is in charge of the experiments, for kindly preparing the data upon which these articles have been based.

R.G.S.

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SUGGESTIONS TO PROSPECTIVE GROWERS OF LUCERNE

HENRY GERARD THORNTON, B.A., D.Sc., and

HUGH NICOL, M.Sc., A.I.C.,

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THE cultivation of lucerne has shown enormous increases in most parts of the world during the past hundred years. In Great Britain, however, it has shown no such increases, but has remained principally confined to the south-eastern quarter of England. Almost every agricultural writer has written in the highest terms about the value of lucerne, and in view of its great advantages it seemed important to investigate the reason for its practical neglect.

Experiments carried out from 1924-1927 made it clear that the principal reason for the restriction of lucerne mainly to the south-east of England lay in the absence from the soil in other parts of the country of the appropriate nodule bacteria.

“Inoculation.”—The nodules on the roots of leguminous plants contain bacteria that capture nitrogen from the air and build it up into compounds that the plant can utilize. These bacteria represent a form of nitrogen manuring to the crop, enabling the latter to grow in land poor in nitrogen compounds and enrich the soil when the roots and nodules eventually decay. To obtain these benefits, the roots must be infected by the special lucerne variety of nodule organism, since other varieties cannot infect it. Where lucerne is introduced into a new area, it will be unlikely to find its own special

nodule bacteria in the soil, and these must therefore be supplied if the full benefits of a good crop of lucerne are to be obtained. The easiest method of doing this is to treat the seed with a culture of the lucerne bacteria before sowing it; a process known as seed inoculation. The details of this process have been improved as the result of recent research at Rothamsted and elsewhere.

After the process had been developed, a series of trials was begun by Rothamsted, in order to discover (1) whether there were districts in Great Britain where inoculation would benefit lucerne, and (2) whether the successful growth of the crop could be extended westwards and northwards by using inoculated seed. The work was commenced in 1924 and carried out with the help of grants from the Royal Agricultural Society. Trials were run at 30 centres. The general result of the trials has been to show that inoculation of lucerne is always advisable in districts outside East Anglia and Kent—and, even there, where the soil is naturally sour, inoculation after liming is desirable to replace bacteria that have been killed out by the unfavourable acidity.

Farmers in the past, using uninoculated seed, have commonly failed to grow lucerne successfully in the west and north of England, and attributed this failure to climatic conditions. The next question to be settled, therefore, was whether the use of inoculated seed would give a reasonable chance of success with lucerne in these districts. To test this question, cultures were sent to about 200 farmers distributed over England and Wales, and the success or failure of their crops from inoculated seed was recorded. The percentage of successes to failures with inoculated seed was as high in the west and north as in the south-eastern quarter of England, showing that the special difficulty in growing lucerne in the former districts must have been mainly due to lack of the appropriate nodule organism from the soil.

Interest in the results of lucerne inoculation caused a demand for cultures which soon became greater than could be dealt with by a research institution. In the spring of 1930, the sale of cultures to farmers and seedsmen was handed over to Messrs. Allen & Hanburys, Bethnal Green, London, E. 2. Inquiries respecting cultures and the method of using them should be addressed to this firm.

Weeds.—It is obvious that "inoculation" aims only at supplying nitrogen to the plant. Other causes, besides lack of nitrogen, account for many failures. An analysis of the

results of trials at 75 centres showed that the immediate cause of failure was in most cases weed infestation. Further consideration, however, shows that in nearly all instances weediness is itself a symptom of unsuitable soil conditions or incorrect husbandry. In the preparation of land for lucerne a most important point is that it shall be clean: it is no use attempting to grow this crop on weedy land.

Soil Conditions and Liming.—Lucerne will thrive in soils of widely varying type and texture, though a deep loam overlying a porous subsoil is undoubtedly the ideal. Lucerne is a very deep-rooting plant, and on this account will not do well in a shallow soil overlying rock or hard pan that the roots cannot penetrate. It often succeeds in fairly shallow soils over chalk—mostly in those locations where the underlying chalk has a tendency to split into cracks along which the roots can descend. Lucerne also requires a well-drained soil and subsoil, often failing owing to water-logging of the subsoil.

One of the commonest causes of lucerne failure is shortage of lime in the soil. The quantity of lime to apply of course depends on the soil, but ordinarily should not be less than one ton per acre of burnt lime, or an equivalent amount of slaked lime, ground limestone, or sugar-beet lime. One ton of burnt lime is approximately equivalent to $1\frac{1}{2}$ tons of slaked lime or two tons of ground limestone. Where practicable the lime should be applied in the previous season; and this is especially advisable where limestone or chalk is used. The lime should be thoroughly incorporated with the soil. An important point with regard to liming is that the nodule bacteria will not long survive in an acid soil. It is therefore necessary to inoculate lucerne that is sown on soil that has required liming, even in a district such as East Anglia, where inoculation is not usually necessary.

Manuring Before Sowing.—Lucerne requires an abundance of plant nutrients in order to thrive. It is also favoured by the presence of plentiful organic matter in the soil. For this reason a dressing of farmyard manure ploughed in is a great help in securing a stand. The farmyard manure should be applied with the previous crop.

Nitrogen fixation, whether in the soil or in the leguminous plant, cannot go on without an adequate supply of phosphates. Lucerne is very dependent upon phosphates, in which farmyard manure is especially poor. Whether farmyard manure is applied before sowing or not at all, land intended to grow

lucerne should receive a dressing of 3 to 5 cwt. per acre of superphosphate or of a high-grade basic slag. Basic slag contributes a small amount of lime, but does not contain enough for a dressing of slag to replace liming where that is needed. A small dressing of muriate or sulphate of potash with the phosphate benefits lucerne on some land, particularly where this is sandy or gravelly.

Varieties.—Strains of lucerne differ considerably in their hardiness, in ability to resist wet, and in length of stand. The two varieties most easily obtainable in this country are Provence and Grimm.

The dangers of frost are apt to be exaggerated, but hardiness is genuinely valuable in the north, and Grimm is more hardy than the Provence, which is favoured in East Anglia. Dr. Cunningham found that Grimm was the only variety that would withstand the winters in East Lothian.

Sowing : Nurse or Cover Crop ; Mixtures.—Lucerne is especially sensitive to weed infestation during its seedling year, and in this country the most severe weed attack usually occurs in the autumn. For this reason it seems better to sow in April or May so that the crop will have time to become established before the autumn weeds develop. It is a common practice to sow in a cover crop of barley, but this practice seems dangerous, as the cover crop checks the lucerne. Where a cover crop is sown it must be a light one. Lucerne is sometimes sown in a mixture containing a light seeding of grasses or clover. Experiments show that there is no advantage in this practice as far as yield is concerned, since the grasses check the lucerne by competition. Where lucerne is sown in a cover crop or seeds mixture it is especially advisable to inoculate the seed, since the plant will need the services of plentiful nodules at an early stage to help it to compete with the other plants.

It is usual in this country to sow lucerne at the rate of 20 to 25 lb. of seed to the acre. Drilling is preferable to broadcasting as it facilitates subsequent weeding and enables the seed to be sown at the right depth, not more than 1 inch. The rows should be about 12 in. apart in order to allow efficient hoeing. Lucerne requires a firm seed-bed, and the land should therefore be well rolled both before and after sowing.

After-Treatment.—During the seedling year it is essential that the lucerne be kept free from weeds, and in some instances

frequent hoeing may be well repaid. Great caution is needed in harrowing lucerne during its first season, but when the crop is established harrowing is likely to be effective in checking the weeds and does not harm the crop. Established lucerne may with advantage be top-dressed with superphosphate, as the crop makes considerable demands upon the phosphate content of the soil.

Cropping.—Many experiments have been made to determine when it is best to cut lucerne. The general conclusion is that the plant should not be cut until it is coming into bloom. Cutting in the bud stage gives a crop somewhat richer in protein, but lower in yield, while cutting at that stage weakens the plant and tends to shorten the length of stand. The harmful effect of early cutting is probably related to the development from the crown of the new shoots that usually arise when the crop is about half in bloom. The crop should not be cut until these new shoots appear: they may, indeed, be regarded as the best indication of ripeness for cutting. The crop should not be mown so close as to injure these new crown shoots. From lucerne sown without a cover crop, it is usually possible to obtain one light cutting in the seedling year, and two or, perhaps, three cuttings in subsequent years. The crop should not be cut after about the middle of September, the later growth should be allowed to remain to protect the plant during the winter. Cutting too late leads to exposure of the crowns and winter killing.

Roughly two-thirds of the feeding value of lucerne is in the leaves, which are apt to fall off and be lost. For this reason lucerne hay requires gentle handling and careful harvesting. To reduce loss of leaves, curing should be done as far as possible in the cock, and raking and turning should be done while the lucerne is still plant. Green lucerne is particularly apt to heat in the stack and special care should be taken that the hay is not stacked before it is thoroughly cured without being too brittle.

Climatic conditions—especially in the wetter districts of England—will sometimes limit hay-making to the first cut. The later cuts may be used green, or, if not allowed to stand so long as to become unduly stemmy, may be made into silage.*

Yield and Feeding Value.—The results obtained from the inoculation trials provide a fair estimate of the yield to be

* See Ministry's Bulletin No. 37, *Ensilage*.

expected in the districts outside the present main lucerne-growing area (East Anglia and Kent). The average yield of green lucerne per cutting from 14 trials, distributed over the South-West, Midlands and North, was 5 tons 1 cwt. (average of 30 cuttings). These yields were given by the inoculated lucerne, and include first, second and sometimes third cuts in the season, but not cuttings made in the seedling year. The average yield of the first cuts of green lucerne was 5 tons 10·2 cwt. and of the second cuts 4 tons 0·4 cwt. The average crop of green lucerne obtained during the seedling year from six trials was 3 tons 8·7 cwt.

The duration of a lucerne ley when well established should be from four to seven years.

Analyses give the following percentages of digestible nutrients contained in various types of hay* :—

	<i>Crude protein</i> <i>per cent.</i>	<i>Carbohydrates</i> <i>per cent.</i>	<i>Oil</i> <i>per cent.</i>
Timothy	4·0	40·6	1·0
Clover, crimson ..	8·3	35·4	1·0
Clover, red (good).	8·5	37·3	1·7
Lucerne (before flowering)	12·1	32·4	1·1

Lucerne contains a very high protein content as compared with other hay and forage crops, and when the yield is taken into account it stands alone among such crops in feeding value. It is also rich in phosphorus and lime, and provides a safeguard against mineral deficiency. It is especially useful on a dairy farm, as it will provide forage in July or in a season of drought when pastures may be bare. Caution should be observed not to overfeed cattle and sheep on green lucerne as there is some danger of bloating.

Effect on Following Crops and Place in Rotation.—Lucerne benefits the succeeding crop both through the action of its roots in breaking up the subsoil and by means of the nitrogen compounds formed in its nodules. Experience has shown that a crop of lucerne leaves a substantial amount of residual material in the soil for the use of subsequent crops. The beneficial effect of lucerne on the succeeding crop is as well established as is the similar value of clover. Experiments at Rothamsted and in the United States, and farming practice

* These figures have been extracted from the Ministry's Miscellaneous Publications No. 32, *Rations for Livestock*, 6th edition (1930).

such as that of Mr. Christopher Turnor, have shown that the manurial effect of lucerne on succeeding crops persists for at least three years.

Lucerne may follow any crop, and may be succeeded by any crop. It is best sown after a hoed crop to obtain the advantage of the clean land and of the farmyard manure applied. Results of extensive research outside Great Britain indicate that it is more advantageous to let sugar-beet follow lucerne than to sow lucerne after sugar beet.

Summary.—The following are the chief points to be observed in the growing of lucerne in this country :—

- (1) The soil must be deep and the subsoil well drained.
- (2) There must be a sufficiency of lime, organic matter and phosphates.
- (3) The land must be clean.
- (4) The seed should be inoculated in all districts outside East Anglia and Kent, and the seed bed should be firm.
- (5) The crop should be kept as free as possible from weeds.
- (6) The crop should not be cut until the new shoots appear from the crown, and the last cutting should not be too late in the season.

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THE COUNTY ADVISER AND THE POULTRY INDUSTRY*

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In the development of any industry organization must play a large part. The poultry industry has developed more rapidly than almost any other branch of agriculture, and if it is to proceed on sound lines there must be very careful organization of all matters affecting its progress.

The county poultry adviser is in a special position to study the particular needs of his locality, but whilst the county in which he works will be his own especial interest, it is necessary for him to take a very wide outlook and to study national and even international conditions, so that he may view the affairs of his own area in a correct relation to the whole industry. He

* Miss Kidd read a paper on this subject at the Summer Meeting of the Agricultural Education Association held at Cirencester, July 27-30, 1931; this article is substantially a synopsis of that paper.

should, as it were, have his finger on the pulse of the industry, and his aim should be to bring conditions in his county up to a standard that will ensure a good revenue for all produce from that area. This entails not only a great deal of instructional work on breeding, feeding, management and marketing, in order to improve the quality and increase the quantity of poultry produce, but it means doing all he can to assist the industry in his county to develop along progressive lines.

The county adviser should first make himself familiar with local conditions. The nature and productiveness of the soils in his area, the markets, the supplies of home-produced foods, the cost of labour and the price of land must also be studied. In the light of this knowledge, the best policy for the development of the industry in the county can then be considered. From a national standpoint, one of the primary needs of the industry to-day is to lower the cost of production.

This could be done by greater attention to specialization and co-operation. Specialization reduces the number of operations on the farm, many of which are seasonal and entail the locking up of much capital, and it also leads to greater efficiency. Co-operation among poultry-keepers would then follow as a natural sequence, and this would do much to strengthen and consolidate the industry to enable it to meet foreign competition.

The day is over when a poultry-keeping neighbour could be regarded as a competitor. We now realize that our real competitor is the poultry farmer overseas, and only by strong co-operation in this country can we adjust our methods of production and marketing to beat the foreigner.

In the ordinary course of his work, the county adviser is brought into contact with a very large proportion of the members of the industry in his county. Opportunities of presenting the theories of co-operation and specialization to poultry keepers are therefore constantly arising. Much can thereby be done to influence the policy and the general line of development of the industry within the county. As the general policy becomes more consolidated, definite organization work can proceed. The line this takes, however, will depend very much on local conditions.

In Surrey, it is felt very strongly that the line to pursue is to attempt to gain the interest of all poultry-keepers within the county, to help them to believe in the future of the industry, to be alive to its possibilities, and to work on good terms of co-operation with each other. Schemes for the im-

provement of stock, the testing of productivity of strains, the recording of special breeding birds, the control and prevention of disease, feeding experiments and competitions in flock management can then be launched with the assurance that there is sufficient interest to ensure their success. As far as possible, these schemes should be linked up with each other in order to consolidate the work in the county.

In Surrey, the County Egg Laying Trials are made a stepping stone to the Approved Breeding Stations. No farm is appointed an Approved Breeding Station until it has qualified on the score of production by gaining a Pen Certificate (equivalent to a score of 6,000 on the old 5-bird pen basis) and is thus given an official indication of the productivity of the strain. Further work in the matter of officially-recorded stock can be done by the establishment of a Cockerel-breeding Scheme, and in counties where this scheme is in operation there is an increased demand for the stock and better prices have been obtained. It is most important that strict measures should be taken to ensure that all stock distributed by Approved and Cockerel-breeding Stations are healthy and free from disease, and in every county now it is required that all breeding stock on such farms shall have passed the agglutination test for Bacillary White Diarrhoea.

The question of disease control opens up another big avenue of work with which the county adviser must concern himself. It should be the ambition of each county adviser to clear up disease in his county to the last case, and many and varied measures will be necessary to carry out this work. Tremendous help in this matter has been given to the industry, in the last few years, by the laboratories specializing in poultry disease, but in the minds of most poultry-keepers it is a far cry from the laboratory to the farm, and the county adviser must act as the link between the two in order to see that full field value is given to this laboratory work.

In a rapidly increasing industry where intensification is taking place, it is most essential that means should be provided to deal promptly with any contingency that might arise. Only in this way can a county adviser safeguard the health of the poultry in his county. These schemes for the general improvement of stock and the control of disease are now operated in varying degrees in most counties, and gradually bring the county adviser into contact with most of the specialist poultry-keepers. There are, however, two classes of poultry-keepers who are scarcely touched by this work, and they are poultry-

keepers on general farms and small or backyard poultry-keepers.

The county adviser should endeavour to interest the general farmer in poultry-keeping for two reasons : (1) because it will increase the revenue from his land, and (2) because it is essential, if the stamina of British stock is to be maintained, that a large proportion of it should be kept on free range. Only the general farm can satisfy these conditions. In the satisfactory development of poultry on the general farm, it is important that there should be close collaboration between the agricultural organizer and the county adviser in poultry-keeping. In Surrey, the progress made with poultry run in connexion with general agriculture is attributed very largely to the fact that a close-working arrangement exists between these two officers. To maintain still closer touch with the general farmer, a scheme was put into operation in Surrey with which all other branches in the department collaborated, and which was called a Travelling Advisory Bureau.

The bureau was established in a village hall for four days, and took the form of an educational exhibit in all subjects dealt with by the committee. At intervals during the day and evening, short talks, illustrated by portable lantern views, and practical demonstrations on culling, handling, blood-testing, vaccinating, and trussing, were given, in addition to demonstrations by other officers of the staff. Advisory visits were also paid in the district. Tours of general farms on which poultry-keeping is carried out on profitable lines have also been organized as a means of demonstrating the value of poultry on the general farm.

The small poultry-keeper is, of course, reached to a certain extent through the Travelling Advisory Bureau, but the County Federation of Women's Institutes provides a much better means of approach. There is a very great increase in the interest in poultry-keeping shown by the Women's Institutes in recent years ; so much so that poultry flock competitions are now being held in Surrey and other counties for members of the Federation, with the object of encouraging smallholders to keep a better class of poultry.

In the matter of marketing the county adviser has, in many counties, been instrumental in greatly improving the local marketing conditions. These vary much in each county, however, so that the same amount of attention to the subject is not necessary in every instance.

Four years ago in Surrey an attempt was made to get all

the poultry-keepers together by organizing an Annual Poultry Conference. This is held just after the close of the laying trials, when the prizes are distributed, and papers are read on matters of current interest by members of the experimental staffs of the National Poultry Research Stations. Discussions are opened by practical poultry farmers in the county and this gives an opportunity for exchange of opinion by many poultry-keepers who might possibly have no other means of meeting each other.

The county adviser should regard himself as a link in the co-operation between all the poultry-keepers, the Agricultural and Poultry Research Institutions, the National Poultry Council, and the future prosperity of the industry. Viewed in that light, there is no limit to the contribution to the industry which it may be his privilege to make.

* * * * *

THE GRADE INSPECTION OF POTATOES UNDER THE CANADIAN ROOT VEGETABLES ACT*

WITH the exception of potatoes in open packages and those in bulk in less than carload lots, all main-crop ware potatoes sold or offered for sale in Canada must be graded in accordance with grades prescribed in regulations made by the Dominion Minister of Agriculture under the powers conferred on him by the Canadian Root Vegetables Act. Further, before the potatoes leave the place of packing, the container, whether it be bag, closed barrel, closed crate, closed basket or bulk carlot, must be marked with the name and address of the seller and the grade of the potatoes.

Violations of these grading and marking regulations occur from time to time, more particularly in the outlying small towns and villages where control is not attempted owing to the expense that would be entailed; but, thanks to educational propaganda extending over a number of years, the proportion of the commercial crop offered for sale ungraded is small. Generally speaking the retailer receives potatoes in the original package, which is correctly marked and the contents of which are properly graded. If the retailer sells

* For the information embodied in this article the Ministry is indebted to Mr. W. B. Gornall, Markets Extension Division, Dominion Department of Agriculture, Ottawa.

in smaller quantities, *e.g.*, five or ten pounds, he is theoretically required to comply with the grading and marking regulations, but it has not been found practicable to enforce the regulations in such cases. The steps taken before the produce leaves the possession of the wholesale distributor to ensure that the regulations are complied with provide ample guarantee that the consumer receives a reliable product.

The enforcement of these regulations necessitates a certain amount of "police" work, and an account is given below of the inspection services that have been organized for ordinary administrative purposes, and to meet a need that has grown up for commercial check inspections. The inspection work is controlled by the Fruit Branch of the Dominion Department of Agriculture.

Administrative (or Control) Inspection Service.—Inspectors are stationed in all districts where potatoes are produced on a commercial scale, and also in the larger city markets. Their duty is to visit places where potatoes are being packed for sale, and to inspect the packages to ensure that the statutory grading and marking requirements are being complied with. They are also authorized to examine any potatoes, whether on the premises of the owner or on other premises, or in the possession of a railway or steamship company, when it is suspected that they have been graded or packed in violation of any of the provisions of the Act or regulations. For each inspection a report is made by the Inspector, but this is not available for commercial purposes. In the case of a violation of the regulations, a copy of the Inspector's report is furnished to the person responsible for the offending pack, but otherwise no copies of the reports on these purely administrative inspections are issued.

If the potatoes meet the requirements of the regulations, the Inspector issues a report in Form "A," a specimen of which is reproduced on p. 59. Should the potatoes fail to meet the requirements as to grade, or should the package not bear the prescribed markings, the Inspector reports on Form "B"—the "Violation Form." This form is similar to Form "A" except that space is provided for information as to the Section or Sections of the Act or Regulations that have been violated.

Violation of any of the provisions of the Act or Regulations renders the offender liable to prosecution, but on the first offence a warning letter of an educational nature is generally sent. A second offence may or may not, according to circum-

stances, lead to a prosecution, but in the event of a third offence a prosecution generally follows.

The above inspection service is for administrative purposes only, and no fees are charged.

Commercial Inspection Service. (a) *Optional*.—It has been found necessary to organize a commercial or requested inspection service, operating at producing, shipping and destination points, for the purpose of providing the shipper, consignee or any financially interested party with a certificate relating to the condition and grade of potatoes to be shipped, or as received, as the case may be. This service is popular, and covers practically the whole carlot movement throughout the Dominion.

For every inspection under this service the Inspector issues a report in Form "C," a specimen of which is reproduced on p. 61, and if a violation of the Act or Regulations is discovered, the Inspector issues in addition a report in Form "B."

For commercial inspection at shipping and destination points, fees of \$3.00 and \$5.00 per carload are payable, respectively. No minimum is placed on the size of lots for commercial inspection, but generally speaking inspection is on a carlot basis. Quantities of less than half a carload are charged at half the carload rate, with a minimum of \$2.00 per hour. Request inspections are always made at the point indicated by the applicant, provided this is within a district over which an Inspector is appointed. If the point is outside the area of an Inspector, the applicant is required to pay travelling and other expenses, in addition to the inspection fee.

In all districts where shipping point commercial inspection is patronized, it is found that a premium in price is obtained over that received in other districts. Shippers and packers willing to pay for the service, in order to ensure that all shipments comply with the grading regulations, are considered to be justly entitled to any premiums that may be offered by the trade, for the service is available to any commercial district on request, provided the tonnage moved is sufficient approximately to cover the local cost of the service.

In producing districts located near large markets the proportion of the tonnage that it is elected to move under the shipping point commercial inspection service is much less than in districts situated long distances from the market. This is because packers and shippers having nearby markets often sell their products direct to the retail trade, or to a trucker who hauls direct from the farm to the retailer or

Inspector's Report

No 7264 A2

FRUIT BRANCH

DEPARTMENT OF AGRICULTURE



CANADA

Place of Inspection

Date 1932

Hour

(This report shall be prima facie evidence of the grade and condition of the fruit or fruit packages to which it refers)

Shipper Address

Consignee Address

No. and Kind of Pkgs. Inspected No. Pkgs. in Lot

Products Inspected Where Inspected

Marks on Pkgs. (Name)

(Address)

No. of Pkgs.	Variety	Grade	DETAILS	Temp. Product
				Temp. Car
				Temp. Warehouse
				Temp. Outside
				Car Initials }
				Kind of Car
				Condition of Car
				S.S.
				Destination

Condition of Pack

Size

Colour

(Other Blemishes and Defects

Maturity

Decay

Condition of Load and Pkgs.

Remarks:—

FRUIT AND VEGETABLE INSPECTOR

Address

N.B.—The products noted in this report have been inspected in accordance with the grades defined in the Fruit Act and the Root Vegetable Act and according to any commercial standard. This report applies only to packages or packages in lot actually inspected.

consumer. In such instances there is practically no demand for commercial inspection at the point of origin, and the potatoes are subject only to inspection for administrative purposes.

(b) *Compulsory*.—In the Provinces of New Brunswick and Prince Edward Island, where large quantities of potatoes are produced for export to other Provinces and out of the Dominion, the industry considered that inspection at the loading or shipping point should be compulsory, and that no carlot should be permitted to move out of the Provinces unless accompanied by a certificate, issued after inspection, to the effect that the shipment meets the requirements of the Root Vegetables Act. To meet this demand, Potato Export Regulations were made; at the present time these apply only to Prince Edward Island and New Brunswick, but they may be extended to other Provinces upon application.

This compulsory inspection service at the point of origin has been in operation for two seasons, and has become a permanent factor in merchandizing potatoes from the Provinces concerned.

In these Provinces loading points are distributed over a very wide area, and in some instances in very scattered territory. It sometimes happens that a carload cannot conveniently be inspected at the point of origin, owing to the remoteness of the district or to adverse weather conditions, and in order to prevent delay in shipment in such cases a system has been devised whereby a release permit is issued allowing the carload to move out of the Province without inspection. Such a carload is inspected at destination, or, if it is intended for ocean shipment, at seaboard, and the fee charged to the shipper. In the case of shipments on rail to a foreign market, a release permit is not issued unless absolutely necessary, as no arrangements can be made for inspection *en route*. Where the issue of release permits for consignments to the United States is unavoidable, the cars are subject to inspection at destination, the inspection service in the United States being similar to that in Canada. Experience has shown that less than 1 per cent. of total shipments move under release permits.

(c) *Re-inspections*.—In the principal distributing markets throughout the Dominion an inspection service is provided whereby, at the request of the shipper, consignee or a financially interested party, a shipment may be re-inspected should it arrive in a deteriorated condition or be rejected

Shipping Point inspection

Destination inspection

Imported inspection

Re-inspection

Inspector's Report

No 5789 C-5

FRUIT BRANCH

DEPARTMENT OF AGRICULTURE



CANADA

Place of inspection

Date 19.....

Hour Start Finish

(This Report shall be prima facie evidence of the truth of the statements contained therein)

Applicant Address

Shipper Address

Consignee Address

Marks on Pkgs (Name)

(Address)

No. of Pkgs	Variety	Grade	DETAILS	Car Initials and Number
				Kind of Car
				PRODUCT
				No. and kind of Packages
				Inspected
				No Pkgs. in Lot
				Where Inspected
				Temp Product—Top
				Bot
				Temp Car—Top Load
				Temp Warehouse
				Outside

Condition of Car

Condition of Load and Packages

Condition of Pack

Size

Colour

Maturity

Decay

Other Blemishes and Defects

Remarks

FRUIT AND VEGETABLE INSPECTOR

Address

H.B.—The products noted in this report have been inspected in accordance with the grades defined in the Fruit Act and the Root Vegetable Act and not according to any commercial standard.

by the consignee. The consignee may demand re-inspection or check inspection for grading if application is made within forty-eight hours of the arrival of the potatoes, but, for re-inspection to cover condition only, application may be made within any reasonable time of arrival.

On re-inspection as to grading, only undersized tubers and such defects as cannot be considered to have developed in transit—*e.g.*, scab, old mechanical injury, cuts and bruises, well developed dry and wet rots—are held to be grade defects. Defects that can reasonably be considered to have developed in transit are regarded as affecting condition only, and not grade. If on re-inspection the shipment fails to meet the requirements of the grade under which it was purchased, the consignee is entitled to refuse the shipment.

A fee is payable on re-inspection, and this is charged to the applicant. In the event of the shipment falling below the grade standard, the inspection at shipping point is presumed to be in error, and the fee for this first inspection is refunded.

Organization of Inspection Services.—Although the administrative and commercial inspections are regarded as entirely separate services, they are not separately organized, but are undertaken by the same Inspectorate. A small staff of permanent and seasonal Inspectors is appointed and located at the important producing and distributing points, and this nucleus is augmented temporarily when and where required to meet the demands for commercial inspections. When a large body of temporary inspectors is required in any particular district, the permanent or seasonal inspectors are generally employed on supervisory duties.

As an illustration of the organization of the inspection work the arrangements in force in New Brunswick may be mentioned. This Province is comparable in size with England, and the acreage devoted to commercial potato production is fairly widespread, aggregating from 40,000 to 50,000 acres. For inspection purposes the Province is divided into five districts, and in each district sufficient Inspectors are appointed to deal with the work at its peak. Each Inspector is allotted one or more loading points, according to the quantity of potatoes shipped, and he is responsible for the inspection of all shipments from such point or points. Employment is usually on a daily basis, and lasts as long as shipping continues. A Supervising Inspector is in charge of each District, and the Province is placed under the charge of a District Inspector. The latter also has charge of Prince Edward

Island, a Province producing potatoes on about the same scale as New Brunswick.

The wide areas covered by the inspection services necessitate the appointment of a large number of Inspectors, for the specific area over which an individual Inspector has jurisdiction must not be too large if his work is to be satisfactory. The principle generally followed is to appoint an Inspector to deal with the work in his immediate neighbourhood, and to employ him only when inspections are required, the standard of his work being maintained by supervision.

The growth of motor transport is creating difficulties in some areas, particularly in the Province of Ontario. When packed products are loaded from central packing houses, no special difficulty arises, but when loading takes place direct from the farm, the cost of an adequate inspection service for commercial purposes is practically prohibitive. The tendency, however, is towards central co-operative packing, and the farm pack is gradually being reduced.

* * * * *

MARKETING NOTES

National Mark Eggs.—In February, the total output of the National Mark Egg Packing Stations was 30·9 million eggs, of which 26·1 million were packed under the National Mark, representing an increase of 54 per cent. as compared with February, 1931.

National Mark Dressed Poultry.—The scheme continues to make steady progress, and there are now ten authorized packing stations. Of these, nine, situated in the counties of Northampton, Gloucester, Somerset, Hampshire, Sussex, Kent and Suffolk, are interested in the marketing of chickens only; the tenth, in Norfolk, is concerned with ducks.

The chief demand is for well-finished chickens, not more than 4 lb. in weight, of good conformation and preferably with white shanks and skin.

National Mark Tomatoes and Cucumbers.—With the object of stimulating the interest of Lea Valley tomato and cucumber growers in the National Mark scheme, a conference, comprising an afternoon and an evening meeting, was held at Cheshunt

on February 15, 1932. At the afternoon session attendance was limited to authorized packers of National Mark tomatoes and cucumbers, Sir William Lobjoit, O.B.E., J.P., of the National Mark Fruit Trade Committee, being in the Chair. As the outcome of a general discussion, the following resolution was passed unanimously :—

“That this meeting declares the National Mark to be calculated to assist the sale and distribution of tomatoes, and recommends it to all growers.”

Mr. H. O. Larsen, J.P., C.C., presided over the evening session, which was open to all growers. At this meeting, Earl De La Warr, Parliamentary Secretary to the Ministry, gave an address on “The Present Position of the Glasshouse Industry.” He referred to the fact that, in addition to the advantage derived by the glasshouse industry through the imposition of Customs duties upon imported produce, growers had a further advantage in the depreciation of the pound. They should realize, however, that some response was called for in the direction of providing the best possible service both to distributor and consumer. This implied standardization and organization.

Glasshouse-growers had always been progressive, and it was well known that they were among the first in this country to grade their produce to definite standards. The standardization of grades and packs, through the institution of the National Mark, had now become a national movement, thus following up the work which the British Glasshouse Produce Marketing Association had started. A wider support for the National Mark should be the first reaction of glasshouse-growers to the new conditions.

Continuing, Lord De La Warr laid stress on the importance of organization. There were many services which organization could render, including co-operation with the Ministry in the practical administration of the National Mark scheme. The nucleus of an organization already existed in the glasshouse industry, and the possibilities of the Agricultural Marketing Act should be seriously considered. It was hoped that misconceptions had now been removed and that growers realized that it was not necessary for any marketing board, established under the Act, to adopt the full range of powers provided. A regulatory board could be established exercising merely directional functions and without engaging in trade at all. Producers could rely on the Government giving all the help in its power to any scheme calculated to be a real and lasting

contribution to the efficient organization of the glasshouse industry.

National Mark Wheat Flour.—The “Buy British” campaign, which has resulted in an increased demand for other National Mark products, has also improved the demand for National Mark flour. In some districts, demand has become firmly established as a result of the Women’s Institute Cookery Competitions held last year.

The following firms have recently been enrolled as authorized packers :—

Bennett’s Saffron Flour, Ltd., 15, The Parade, Plymouth.
G. Darby & Son, Pymoor, Ely.

National Mark Canned Fruit and Vegetables.—The demand for National Mark canned fruit and vegetables has been encouraging and most of the factories have now sold the whole of their 1931 pack.

New canning factories have recently been erected or are in course of erection at North Walsham (Norfolk), Wroxham (Norfolk), Slough (Bucks) and Barming (Kent). Applications have already been received from three of the new factories for authority to apply the National Mark to their products.

The inspection service which is necessary to maintain the standards and requirements of the Scheme is provided by the Ministry. Frequent visits are paid to the factories while canning is in progress, when every operation is inspected and samples are drawn from factory stocks. The samples are sent for examination to the University of Bristol Fruit and Vegetable Preservation Research Station at Chipping Campden. The reports of the Research Station on each factory’s samples are communicated to the canner concerned. Samples are also obtained from retail distributors. At the end of each season, the operation of the Scheme as a whole is reviewed.

The following points arise from the review of the 1931 pack :—

Quality Grading of Fruit and Vegetables.—There was satisfactory evidence that all canners had endeavoured to attain a uniformly high standard of quality, although greater uniformity as between factories is still desirable. Factors bearing on the maintenance of high quality are (1) adequate factory supervision and (2) the original quality of the fruit. It is a matter of supreme importance to the future of the industry that adequate supplies of high-quality, graded fruit should be available.

Size-Grading of Fruit and Vegetables.—There was a definite improvement in the size-grading of the fruits and vegetables packed. Further improvement depends on closer factory supervision and the use of more efficient sizing machines. Size-grades have not so far been defined under the National Mark Scheme, but the practicability of introducing them is now under investigation.

Syrup Strengths.—There was a tendency to pack fruits in heavier syrups than in 1930. In a number of cases, the strengths used were five per cent. above the *minimum* strength laid down by the Regulations—i.e. 45° Brix for soft, and 40° Brix for stone fruits. One firm made use of the tentative "Extra Heavy" syrup grade (55° Brix) recommended at the beginning of the season.

Standardization of Can Sizes.—The standardization of the sizes for cans is now practically complete. The following six sizes will be standard sizes for National Mark canned fruit and vegetables in 1932—viz, A. 10; A. 2½; A. 2; Tall A. 1; E. 1; and American Picnic. Cannery with stocks of ¾ E. 1 and ½ E. 1 cans will be allowed to use the National Mark with these sizes during 1932 only.

Vacuum in Cans.—The recommendation that greater care should be exercised in the control of head-space and vacuum has borne good results and vacua are now generally satisfactory.

Weight of Fruit in Cans and Weight of Total Contents.—The experimental schedule of weights recommended for the 1931 season has been adhered to in most cases. The schedule is being revised in the light of experience.

Research Problems.—With the object of keeping factory technique abreast of scientific progress, arrangements have been made for the submission to the Campden Technical Advisory Committee of various problems confronting the industry.

Publicity for National Mark Produce.—During March, National Mark beef was advertised in the Birmingham, Leeds and Bradford newspapers, and National Mark eggs in grocers' and dairymen's trade papers and in a number of women's journals. National Mark eggs were also advertised by means of a poster-set displayed on the Empire Marketing Board's advertising frames in all the large and many of the smaller towns in England and Wales, from March 7-29. The poster-set illustrated the standard containers in use for National

Mark eggs, the four weight-grade labels, and the increase in output since the National Mark Egg Scheme was introduced early in 1929.

Marketing Demonstrations.—Arrangements are being made for marketing demonstrations to be staged at the following Agricultural Shows in 1932 :—

<i>Date.</i>	<i>Name of show.</i>	<i>Location.</i>	<i>Nature of exhibit.</i>
May 17-19	Devon County	Tavistock	National Mark Hall ; Mutton ; Butter ; Organization of Wool Marketing.
„ 25-28	Bath & West	Yeovil	National Mark Hall ; Butter ; Wool.
June 1-4	Royal Counties	Guildford	National Mark Hall ; Egg Grading Demonstration.
„ 2	Cambs. & Isle of Ely.	Wisbech	Organization of Potato Marketing ; National Mark Fruit.
„ 7-9	Three Counties	Gloucester	National Mark Fruit ; National Mark Canned Fruits and Vegetables ; Cider.
„ 8-9	Essex County	Colchester	National Mark Hall ; Potatoes.
„ 23	Herts.	Hatfield	National Mark Hall.
„ 22-23	Sussex County	Eastbourne	National Mark Hall ; Wool.
„ 28-30	Peterboro'	Peterboro'	National Mark Hall ; Potatoes.
July 5-9	Royal Agr. Socy. of England	Southampton	National Mark Hall ; Butter ; Wool ; Potatoes.
„ 12-14	Great Yorks.	Leeds	National Mark Hall ; Wool ; Potatoes ; Mutton.
„ 19-20	Tunbridge Wells	Tunbridge Wells	National Mark Hall ; Potatoes ; Egg Grading Demonstration.
„ 20-22	Royal Welsh	Llandrindod Wells	Butter ; Wool ; Mutton ; National Mark Eggs.
„ 28-Aug. 1	Royal Lancs.	Preston	National Mark Hall ; Potatoes.

London National Mark Egg Window-Display Competition.—The December issue of this JOURNAL contained a reference to the speech made by Mr. Gordon Selfridge, at the Livery Banquet of the Worshipful Company of Gardeners, in support of the National Mark for English agricultural produce. Mr. Selfridge has since very generously offered the sum of 100

guineas to the Ministry for the purpose of a National Mark egg window-display competition open to all grocers, dairymen, multiple shop branches and co-operative societies in the London postal area, to be held in the week commencing April 18. The windows will be judged, in the first instance, on photographs of displays forwarded by competitors. The best twenty windows will then be inspected personally by a small committee of judges. The prizes will be as follows :—

- 1st Prize.—Silver Cup to the value of £40 with a cash award of £8 to the window dresser.
- 2nd Prize.—Silver Cup to the value of £20 with a cash award of £5 to the window dresser.
- 3rd Prize.—Silver Cup to the value of £15 with a cash award of £4 to the window dresser.
- 4th Prize.—Silver Cup to the value of £10 with a cash award of £3 to the window dresser.

Agricultural Marketing Act, 1931:—(a) *English Hops Marketing Scheme.*—A scheme under the Agricultural Marketing Act for regulating the marketing of hops grown in England—the first scheme formally submitted to the Minister—was received on March 8. The following is a copy of the Minister's Statutory Notice of Submission published in the *London Gazette* of March 11.

Notice is hereby given that a scheme for the regulation of the marketing of hops under the Agricultural Marketing Act, 1931, has been duly submitted to the Minister of Agriculture and Fisheries. The scheme is applicable to England.

Copies of the scheme may be obtained, on payment of one shilling per copy (post free), from the Secretary, National Farmers' Union, 45, Bedford Square, London, W.C.1, or may be inspected on personal application at the before-mentioned address (except on public holidays) between the hours of 10 a.m. and 5 p.m. on weekdays, and 10 a.m. and 12 noon on Saturdays.

Any objections and representations with respect to the scheme should be addressed to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1, so as to reach him not later than April 22, 1932. Every objection must be made in writing and must state the grounds of objection and the specific modifications required.

(Sgd.) A. W. STREET,
Assistant Secretary.

This notice has also been published in a number of papers circulating in the hop-growing areas.

The promoters of this scheme hope that, if approved, the scheme will come into full operation in time to apply to the current year's crop.

(b) *Scottish Raspberry Marketing Scheme.*—The distinction of being the first marketing scheme to be submitted under the Act attaches to the Scottish Raspberry Marketing

Scheme, which was forwarded to the Secretary of State for Scotland in the middle of February. The scheme, which is not intended to apply to the 1932 crop, regulates the marketing of raspberries (including both fresh raspberries and raspberries which are preserved or pulped either in SO_2 or otherwise) produced on the mainland of Scotland. Copies of the scheme may be obtained, price 3d. per copy, on application to the Secretary, Department of Agriculture for Scotland, York Buildings, Queen Street, Edinburgh, and objections and representations to the scheme may be made to the Secretary of State by addressing them to him at the foregoing address or at the Scottish Office, Whitehall, London, S.W.1, not later than April 6, 1932.

(c) *Statutory Rules and Regulations.*—The following Statutory Rules and Regulations under the Act have been made or issued in draft :—

THE AGRICULTURAL MARKETING (PUBLIC INQUIRY)
(ENGLAND) DRAFT AND PROVISIONAL RULES, 1932.

THE AGRICULTURAL MARKETING (PUBLIC INQUIRY)
(GREAT BRITAIN) RULES, 1932.

These Rules govern the procedure of public inquiries into objections to schemes, and are required to be made under Section 1 (6) of the Act. As a matter of urgency, the rules applicable to England have been made in Draft and Provisional form and come into operation forthwith. The Rules applicable to Great Britain have been issued as Draft Statutory Rules and Orders.

THE AGRICULTURAL MARKETING (REORGANIZATION COMMISSION) (ENGLAND) DRAFT AND PROVISIONAL REGULATIONS, 1932.

THE AGRICULTURAL MARKETING (REORGANIZATION COMMISSION) (GREAT BRITAIN) DRAFT AND PROVISIONAL REGULATIONS, 1932.

These Regulations govern the procedure of Agricultural Marketing Reorganization Commissions constituted under Section 15 (1) of the Act, and are made in pursuance of the powers conferred by Section 16 (3). On grounds of urgency, the Regulations have been made in Draft and Provisional form and come into operation forthwith.

THE AGRICULTURAL MARKETING (FACILITIES COMMITTEE)
REGULATIONS, 1932.

These Regulations govern the procedure of all Agricultural Marketing Facilities Committees appointed under Section 12 of the Act to consider and make recommendations with respect

to the making and renewal of loans out of the Agricultural Marketing Funds. The Regulations, which are to be made in pursuance of the powers conferred by Section 16 (3) of the Act, have been issued as Draft Statutory Rules and Orders.

Copies of the above Rules and Regulations can be obtained through any bookseller, or directly from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1d. each net.

Report of the Second Inter-Departmental Committee on the National Mark Beef Scheme.—The Committee appointed by the Minister of Agricultural and Fisheries and the Secretary of State for Scotland, under the Chairmanship of Lord Kirkley, to review the progress of the National Mark Beef Schemes in England and Scotland and to make recommendations have now published their Report.* The first Committee on this subject, which sat under the Chairmanship of the late Lord Henry Cavendish Bentinck, reported in August, 1930.

In the main body of its Report the Committee confines itself to outlining briefly the history of the scheme since the Bentinck Committee reported. Full details of the progress of the scheme from the commencement, together with statistics showing the quantities of beef graded and marked and the costs of grading, marking and publicity, are given in a number of appendixes. The average cost per side of the grading and marking service in 1931 was 1s. 1½d. in England and 8d. in Scotland; that is to say, the cost in England amounted to less than one-twentieth of a penny per lb. on the average side of beef.

During the period covered by the Committee's Report, the outstanding factor affecting the progress of the scheme has been the opposition of the main meat-trade organizations. This, the Report points out, adversely affected the amount of beef submitted for grading, increased the difficulties of administration and also the unit costs of grading and marking.

The Committee, after considering evidence, both written and oral, from a large number of agricultural and meat trade organizations, as well as from many independent witnesses, mainly meat traders, have arrived at the conclusion that the scheme is a desirable step in the direction of better marketing of meat and livestock in this country. They consider that it is tending to increase the demand for home-fed beef of good

**Report of the Second Inter-Departmental Committee on the Grading and Marking of Beef.* H.M. Stationery Office, price 1s. 0d. net.

quality and to eliminate short-period fluctuations in prices. The effects of this increased demand are bound to be reflected back to the cattle feeder and to lead, ultimately, to an improvement in the quality of beef cattle produced in Great Britain. Obviously, however, the scheme has not yet been in operation long enough, or on a sufficient scale, to have had an appreciable effect on the general standard of British beef cattle.

The Committee consider that the guarantee of quality and origin provided by the Mark affords a necessary guide to the consumer in buying home-produced beef. There is, however, room for further education of the public as to the objects and advantages of the scheme.

It has frequently been suggested that all that is necessary in order to enable the consumer to distinguish imported beef from home-fed is to require all imported beef to be marked conspicuously with an indication of origin. This, however, in the Committee's opinion, would not be an adequate substitute for the National Mark Scheme. In the first place, it would not give the buyer any indication of quality; and in the absence of any quality mark on the best home-fed beef it might give rise to unfavourable comparison of imported beef with the inferior sorts of home-killed.

The Committee consider that the scheme is of considerable advantage to the distributor of good-quality home-killed beef. It gives publicity to the high-class shop, tends to regularize demand, and facilitates buying and selling. Traders who are mainly interested in imported beef and the inferior qualities of home-killed have obviously nothing to gain from it.

As regards the future of the scheme, the Committee consider that, in the interests of British agriculture, it should not only be continued but should be extended to such other areas as are considered suitable by the Departments concerned. Certain obstacles to the continuance of the scheme on its present free and voluntary basis are, however, foreseen. It was never intended that the State should continue indefinitely to finance the scheme, and the Committee consider that the time has now arrived when at any rate most of the cost should be placed upon the commodity. But, at present, there appears to be no practicable means of obtaining a contribution towards the cost from beef producers, in whose interests the scheme was primarily established. Moreover, the Committee point out that, so long as the scheme continues on a voluntary basis, its success will always largely depend on the goodwill of the distributive trade, and here the difficulty is that most traders are

interested in the sale of beef that is not qualified to bear the Mark.

As a solution, the Committee consider that some form of compulsory scheme should be established, under which a fee should be charged for grading and marking. The ideal solution would, in their opinion, be the formation by cattle feeders, under the Agricultural Marketing Act, 1931, of a marketing board, or boards, which would make grading and marking a condition of sale or re-sale of fat cattle, and would contribute a lump sum, raised by levies on all beef feeders, towards the expenses of grading and marking. This development may come in due course. Meanwhile, the Committee recommend, as an immediate measure, that the Minister of Agriculture and Fisheries and the Department of Agriculture for Scotland should be empowered by Parliament to grade and mark any home-killed beef in prescribed areas. They should also be empowered, after a short experimental period in any such area, to recover the cost of grading and marking from the owners of the beef at the time of grading.

Sugar-Beet.—Preliminary returns of the 1931-32 beet sugar manufacturing season in England and Wales are now available. The area of 233,219 acres under sugar-beet represented a decrease of 114,038 acres, or 33 per cent., compared with that of the previous year. This decrease is to be attributed to the lower beet prices operating and, doubtless, to the delay in offering contracts.

The weather in 1931 was, in general, distinctly unfavourable to the crop. At seeding time, conditions were mostly cold, sunless and wet, many early sowings being washed out of the ground. During the early part of the growing season, the weather was not unduly adverse, but the period from July to September was marked by abnormally low temperatures and torrential rains. In the low-lying areas, crops were inundated for many weeks. Hoeing and cleaning operations were carried out with difficulty and weeds grew strongly, while fertilizers were very erratic in their action owing to the excessive moisture. Under these inclement conditions the crop suffered severely, the plants developing luxurious tops at the expense of the roots, which were fangy and small in size. In October, however, the weather improved, turning dry and generally mild, except for some severe early frosts, and harvesting proceeded without hindrance until the middle of November, when heavy rains again fell.

As in 1930, the roots did not gain in weight as the season advanced ; this was probably due to the fact that early frosts stopped further growth. The yield was noticeably poor, the average of 7·1 tons per acre comparing with 8·8 tons in 1930 and 8·7 tons in 1929. On the other hand, the sugar-content was more satisfactory, the average of 17·3 per cent. showing improvement over the 1930 average of 16·7 per cent., although below the 1929 figure of 17·7 per cent. The total quantity of beets delivered to the factories by the 32,300 growers was about 1,656,000 tons as against 2,989,468* tons delivered by 40,415 growers in 1930.

The reduced yield was reflected in a reduction of the commercial sugar produced per acre, which, on a total sugar production of 5,014,000 cwt., averaged about 2,410 lb., or some 300 lb. per acre less than in 1930. The manufacturing efficiency of the factories was, however, the outstanding feature of the season, the sugar extraction of 15·1 per cent. (the production of sugar expressed as a percentage of the weight of roots delivered) being the highest yet recorded in this country. The quantity of dried pulp produced was 147,000 tons, of which 45,000 tons was plain and 82,000 tons molassed. About 5 per cent. of the dried pulp was exported. The production of wet pulp was 18,000 tons and that of molasses 1,065,000 cwt. Owing to the fangy roots and late rains, dirt tares were heavy, being 15·6 lb. per cwt. of beet against 14·8 lb. and 13·4 lb., respectively, in 1930 and 1929.

It is reported that the steady improvement in cultivation methods noted in previous years was maintained in 1931. The fact that the growing season was less favourable than that of 1927, when the yield was only 6·45 tons per acre and the sugar-content 16·1 per cent., is an indication of progress.

* * * * *

*In 1930, a further 59,859 tons of beet were grown in England, but delivered to the Cupar factory in Scotland.

APRIL ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,

Director of Agriculture for West Sussex.

Arable Land.—Seeds of clovers and grasses should be sown early to give them every chance of establishment before the cover crop is too far advanced or the soil becomes too dry. Such seeds should be covered, but not too deeply. Clover seeds, in particular, must have a firm seedbed, and this, no doubt, accounts for the more vigorous growth which can often be observed on headlands or near gateways. A good practice is to roll the ground, then broadcast the seeds, harrow with a light harrow and again roll.

Fallow and Cleaning Crops.—The rotation of a particular district is generally determined after years of experience ; yet a rotation should not become a hard-and-fast rule, but be varied according to circumstances and markets. One feature, common to all rotations, is that they must have a fallow or cleaning crop. A wide choice is available and individual circumstances must determine whether or not a cleaning crop shall be grown or the land merely bare-fallowed. A large area of the heavy clay soils, that, until recent years, were maintained in arable cultivation, have been seeded down to permanent pasture. There is still, however, much good cereal-growing land maintained in cultivation that is difficult and expensive to prepare for root growing, and these bare fallows are justified. A bare fallow is not only a cleaning operation ; given a dry and sunny summer the soil texture is very much improved, insect pests are reduced and the succeeding corn crop is benefited to a degree that cannot be explained merely by the elimination of weeds. The plough is the best implement to use on bare fallows. The aim should be to keep the soil in blocks, well turned up to the sun and wind so that the soil will "bake." Land to be bare-fallowed should not be ploughed too early in winter, and a cross ploughing should take place this month ; thereafter, the number of ploughings will be determined by weather conditions. Weeds should not be allowed to grow and, if wet weather is experienced in early summer, ploughing will require to be done more frequently. Thistles are often a nuisance, and it is a wise precaution to use a broad share and thus ensure the complete severance of every thistle. In some instances, subsoiling during midsummer has brought about a remarkable diminution of thistles.

On all medium and light types of soils, some form of cropping is better than a whole bare fallow. Fallow crops, such as potatoes and sugar beet, are especially useful, since they not only provide an opportunity for cleaning the land, but, as crops which can be sold and cashed direct, may just pay their way or even leave a profit. The area under these crops is limited. In the case of potatoes we can, and sometimes do, produce more than is required for human consumption, and the production of potatoes for stock food, or for industrial purposes, is not economically justifiable at present. Sugar-beet acreage is limited by the distance from the beet sugar factories, the reduced price now in operation being too small to justify heavy freight charges.

About half the fallow area in England and Wales is devoted to such crops as turnips and swedes, mangolds, cabbages, kales and rape, all of which require conversion by live stock to obtain a money return. This is not a drawback provided it can be done at a profit. Mangolds, turnips and swedes require to be drilled, singled and repeatedly hoed if a full crop is to be produced. This entails a good deal of manual labour, and such crops are, consequently, expensive to produce. Much labour may be saved by substituting a crop like rape which, even although drilled, can be grown with a minimum of manual labour and produce valuable autumn and early winter feed for sheep. A mixture of rape and kale can also be used and provides an exceptional amount of very good stock food.

Marrow stem kale, by itself, is possibly the best of all "root" crops for late autumn and early winter use. There are still some farmers who have not used this crop as much as they might. The crop is a gross feeder and requires good land or heavy manuring if it is to succeed. Manured as for mangolds, and drilled in rows 18 inches apart, singled to 12 inches apart, strong individual plants may be expected. A succession of sowings may be made from mid-April to mid-June, and the crop can be used from September to February. If cut and carted off for feeding cattle, it is well to remember that the crop takes away much manurial matter and leaves little crop residue behind, hence the reason for the common practice, with marrow stem kale, of using farmyard manure both before and after a crop.

Another method of utilizing the fallow area that appears to be growing in popularity is the sowing of a mixture of peas, vetches and oats either for hay or silage. There is

still time to sow such a crop, and a mixture of 40 lb. peas, 40 lb. vetches and 80 lb. oats is a suitable seeding. If silage is contemplated, it is an advantage to use beans instead of vetches, as the crop stands up better and is easier to handle. For haymaking, beans are unsuitable as they take too long to dry.

The mixture should be cut for hay just when the peas and vetches are coming into bloom and before pods are formed. For silage it is an advantage to wait a week or ten days later. In either case the crop is removed early enough to admit of late summer cleaning, and this work should not be difficult, especially after the harvesting of a close bulky crop of forage. On medium and light soils, some objection may be taken to this practice, as it involves keeping the ground bare in the late summer months and increases the risk of an attack of wheat bulb fly in the following wheat crop, the eggs having been laid on dry, dusty, bare ground in August.

Light soils are not suited for a complete bare fallow. On such soils, some provision should always be made for the sowing of a cover crop in July. Mustard is well suited for this purpose, and a seeding of 20 lb. per acre will provide a green crop that can be fed off by sheep or ploughed in as a green manure.

Whatever the practice during the fallow year, it pays to do it well. A half crop of roots is nearly as expensive as a full crop and much more costly per ton. Crops that are fed off by sheep on the land will return a manurial dressing corresponding to the size of the crop, and the results will be felt throughout the rotation.

Grass Land.—The interest of the farmer is how to utilize his grass to the best advantage. Assuming the meadows have been manured and cultivated so as to produce increases both in quality and quantity, the utilization of the grass can make a material difference to the returns obtained. Milk cows and ewes with lambs derive enormous benefit from early grass, and money returns soon follow. For such classes of stock, special treatment to ensure early grass is well worth while. This may be done by saving some dry, south-lying, sheltered fields specially for the purpose and removing all stock from these as far back as the end of December. Possibly a top-dressing of a nitrogenous fertilizer may have been applied in late February or early March. This manuring practice can be justified in very many instances. The advisability of

applying dressings of nitrogenous manures later than the beginning of April is, however, doubtful.

What was commonly referred to as the intensive manuring system, whereby the grass received repeated dressings of nitrogen throughout the summer and autumn, is not likely to be widely practised. The economic return is too small to justify the practice and, in the writer's experience, it is difficult to avoid a deterioration in quality of grass and a reduction in clover. Experiments may indicate that the system will work, but the removal of grass by a lawn-mower is one thing and the eating off of the grass by cattle is another; and, although cattle, if compelled to do so, will eat grass down as well as a mower will cut, it has to be done at the expense of the welfare of the cattle.

Woodman and others have done invaluable work in determining the nutritive value of grasses at their different stages of growth, and this information is of the greatest value to the farmer when deciding how he shall stock his pastures; but, in practice, the grass can only be removed within the limits of its profitable use by stock.

The practical farmer's difficulty is how to make the best all-the-year-round use of his grass. He has to be prepared to deal with half the year's growth of grass during April, May and June. It is not an easy problem, and no two years are quite alike in this respect. Stocking to the full during May and the consumption of grass at its most nutritive stage that month may mean disaster for the rest of the year.

Many types of soils in the south of England, if grazed very hard throughout May, will not recover, with a normal summer, until late autumn. Such soils require a cover of grass to prevent burning up and a stoppage of growth, and very close grazing is not practicable during the early summer months. On all soils, the principal drawback to very close grazing is that whilst it may maintain nutritive quality it diminishes the total amount of starch equivalent, and the farmer must have regard to both these factors. On the other hand, it would be as bad to allow pastures to "ramp" away into strong growth. Such a procedure would be injurious and, on pastures of the Romney Marsh type, would be ruinous. Moderately-close grazing can be aimed at in most cases, and, to meet the flush of grass in May, part of the area can be saved for hay. If cut early in June, the aftermath will come in as a useful addition to the fields grazed during May and June. The fields that provided the early grass in April might

be the most suitable for haymaking. If grazed up to the beginning of May, they might not produce a heavy cut of hay in June, but it would be of good quality, but, if left too long before cutting, the chances of a good aftermath would be diminished.

* * * * *

NOTES ON MANURES

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The Exposure of Farmyard Manure.—In a general way, it has long been known that farmyard manure undergoes more or less serious deterioration if left exposed for some time on the surface of the land before ploughing under. This point, however, like other factors relating to dung management, has received comparatively little attention from experimenters. In 1931, one of the Rothamsted experiments on sugar-beet was designed to throw light on the matter. On half the plots dung was spread on the surface at the rate of 20 tons per acre, and left exposed for three weeks before it was finally ploughed under on March 17; on the remaining plots the same weight of dung was spread and ploughed in at once on the date mentioned. The resulting yields of roots and tops were as follows :—

	Roots :	Tops :	Sugar :	<i>Sugar</i>
	tons	tons	per cent.	per acre :
Dung ploughed in at once	13·04	16·78	19·19	50·0
Dung exposed for three weeks	12·27	15·12	19·33	47·4

It will be seen that a considerable loss of crop resulted from the exposure of the dung, amounting to 15 cwt. roots, 33 cwt. tops and 2·6 cwt. sugar per acre. These differences are well outside the experimental error, and at the usual rates mean a loss of about 35s. per acre, or about 50s. where the tops are valued for stock feed. The effect is due to loss of ammonia-nitrogen, the most valuable part of the manure; and this loss can only be made good by the further addition of quick-acting nitrogen. Other trials have shown that, to produce 15 cwt. of roots and the accompanying tops, at least 1 cwt. of nitrogenous manure per acre would be required.

The most extensive experiments on this aspect of dung management were carried out by K. Iverson in Denmark, and the results are very consistent and remarkable. Exposure of dung for even a few hours resulted in a quite appreciable loss of crop-producing power, and for practical reasons this must

be accepted as inevitable. Four days' exposure, on the other hand, reduced the effect of the dung, so far as the first crop was concerned, to half that of the quantity of dung ploughed-in at once.

Some of the results are as follows, the figures being on a percentage basis :—

	<i>Barley</i>	<i>Oats</i>	<i>Turnips</i>
No dung	65	78	76
Full dung ploughed in at once	100	100	100
" " " " after 6 hrs	97	97	98
" " " " " 24 hrs.	96	94	94
" " " " " 4 days	88	86	87
Half quantity of dung ploughed in at once	89	88	88
Date of applying dung	April 12	April 7	Nov. 24

The actual loss of crop, following four days' exposure, was, in English units, 7 bush. of barley, 10 bush. of oats, and 4 tons of roots per acre, respectively.

These effects were studied in relation to the weather prevailing between spreading and turning under, and it was found that, while still, damp weather slightly reduced the losses, in most cases the general result held. Laboratory studies, in which the manures used in the experiments were exposed on trays under the prevailing field conditions and the loss of nitrogen was determined, showed losses ranging from 13 to 29 per cent. of the original nitrogen.

Assuming a normal composition for the original manure used in the above experiments, one may estimate that four days' exposure of the manure given to cereals resulted in a loss of roughly 20 lb. of nitrogen per acre, while, with the heavier dressing applied to roots, the loss would approximate to 40 lb. of nitrogen per acre. These amounts are equivalent to about 1 and 2 cwt. of sulphate of ammonia, respectively. The observed loss of crop corresponds fairly well with what might be expected from the loss of the above quantities of nitrogen.

Manures for Roots.—The following notes on manuring root crops are intended to call to mind certain points that have become fairly well established by experiment and accumulated experience, and also to indicate directions in which further information is required. In the first place, dung is usually given to root crops where it is available. This at once raises the question whether the presence of dung limits the need for artificials, or whether its all-round effect, in improving conditions for growth, may not enable the crop to make use of at least as much plant food in the form of artificials as would be

used in the absence of farmyard manure. In practice, it is usually assumed that the first possibility is the correct one ; but a series of experiments on root crops, testing the effects of each of the nutrients singly and in combination, and in the presence and absence of dung, might cause this view to be modified in certain instances. As far as potash is concerned, experiments at Rothamsted show that dung somewhat reduces the need of potatoes for potash, but there is less evidence in the case of the other nutrients.

Potatoes.—This is probably the most responsive crop to fertilizer treatment. Even for rich fenland soils, instances are on record in which potatoes have responded to phosphate, nitrogen and potash when sugar-beet, grown alongside, produced a full crop on the resources of the soil. Looking through experimental results, it is rare to find instances in which manuring has failed to improve the yield of potatoes, but not so rare with other crops.

Probably, the more usual mixture of artificials for potatoes, grown with farmyard manure, is 1 cwt. sulphate of ammonia, 4 cwt. superphosphate, 1 cwt. sulphate or muriate of potash per acre, i.e., 6 cwt. per acre of a mixture providing about 3.3 per cent. nitrogen, 10.7 per cent. soluble phosphoric acid (23 per cent. soluble phosphate) and 8.0 per cent. potash. In the extensive experiments carried out by County Instructors at 353 centres in Ireland, this mixture, using muriate of potash, when added to 15 tons of dung, gave an average increase of 2 tons 11 cwt. potatoes per acre.

Further experiments by the same workers, to ascertain whether any modification of the quantity or balance of this mixture was desirable, only served to confirm its suitability over a range of conditions. Similar conclusions were reached by J. C. Baird,* working with the modern experimental technique in Northern Ireland, although there were indications that the amount of phosphate might be slightly reduced.

Under English conditions, there is a tendency to use higher dressings of nitrogen and of potash, 2 cwt. sulphate of ammonia, 4 cwt. superphosphate, and 2 cwt. sulphate of potash being quite usual, while even higher dressings are used in intensive districts and when dung is scarce. In situations where good crops can be grown, there is something to be said for the higher scale of dressings in the absence of definite contrary evidence, for the extra cost would be covered by a further 7 cwt. of potatoes per acre ; and English experiments have shown that

* *Jour. Min. Agric. N. Ireland*, III, 1931, p. 124.

this is a modest expectation from the use of a further hundred-weight of nitrogenous and potassic manure.

Experiments in Scotland at many centres over a period of years tell a somewhat similar story :—

	Yield : tons per acre			
	1928	1929	1930	1931
Dung only	7.55	10 50	9 20	6.15
Dung, 2 cwt. sul. ammonia, 3 cwt. super., 2 cwt. sul. potash	10.85	14 20	11.15	8.75
Dung, 3 cwt. sul. ammonia, 3 cwt. super., 3 cwt. sul. potash	11.85	15.15	12.25	9.70

The question of balance of nutrients within the mixture is not one that can be answered in general, for the reserves of the soil affect the result. The problem requires experimental study by large-scale growers for their own information, while the approximate balance for certain rather definite soil types might be worked out by the local advisory staffs. As regards preliminary experiments on this question, conducted in co-operation with Rothamsted, the indications are that the proportion of potash and of nitrogen found in the usual mixture may be increased with advantage.

Sugar-Beet.—Turning to sugar-beet, there is plenty of evidence that a mixture of the type, 4 cwt. superphosphate, 4 cwt. kainit and 1 cwt. sulphate of ammonia, is an excellent supplement to dung. In recent Irish experiments such a mixture gave a further 3 tons of washed roots per acre when added to 12 tons of dung—an average result for 31 centres. A top-dressing with nitrate of soda, or other quick-acting nitrogenous manure, will usually be necessary in addition. The choice of low-grade potash salt is in accord with English experiments, which usually show an advantage from common salt both in yield and sugar-content. When kainit or other low-grade potash salts are used in home made fertilizer mixtures, it is a safeguard against trouble at sowing time to incorporate about 10 per cent. of steamed bone-flour or ground rock-phosphate in the mixture to act as a drier ; such mixtures are best made up and applied at once.

On rich soils, and in presence of farmyard manure, sugar-beet sometimes gives less response to potash and to nitrogen, although the tops will be increased in such cases. This fact should be borne in mind when such soils are being manured ; while the nitrogen and potash in the suggested scale of dressing may be increased on light and hungry soil, it probably suffices

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended March 9				
	Bristol	Hull	L'pool	London	Cost per unit at London
Nitrate of soda (N. 15½%) ..	£ s. 9 0	£ s. 9 0	£ s. 9 0	£ s. 9 0	s. d. 11 7
" " Granulated (N. 16%) ..	9 0	9 0	9 0	9 0	11 3
Nitrate of lime (N. 13%) ..	"	"	"	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia:—					
Neutral (N. 20·6%) ..	7 0d	7 0d	7 0d	7 0d	6 10
Calcium cyanamide (N. 20·6%) ..	7 0c	7 0c	7 0c	7 0c	6 10
Kainit (Pot. 14%) ..	3 16	3 9	3 0	3 6g	4 9
Potash salts (Pot. 30%) ..	6 1	5 14	5 1	5 11g	3 8
" (Pot. 20%) ..	4 7	4 1	3 10	3 19g	3 11
Muriate of potash (Pot. 50%) ..	11 9	10 17	9 9	10 18g	4 4
Sulphate " (Pot. 48%) ..	13 12	12 19	11 15	13 0g	5 5
Basic slag (P.A. 15½%)||	2 10c	2 0c	"	2 6c	2 11
" (P.A. 14%)||	2 5c	1 14c	1 14c	2 1c	3 0
" (P.A. 11%)||	"	1 9c	1 9c	"	"
Ground rock-phosphate (P.A. 26-27½%)||	2 10a	"	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%)	3 2	"	3 7	2 17k	3 7
" (S.P.A. 13½%)	2 17	2 9	3 2	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	8 15	7 0	7 0	6 15	"
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 19b	5 5f	6 0	5 5	"
Burnt lump lime ..	1 4p	1 2l	1 9	1 19n	"
Ground lime ..	1 9p	1 8l	"	1 18n	"
" limestone ..	1 3p	1 4p	1 7m	"	"
" chalk ..	"	1 4p	"	1 6n	"
Slaked lime ..	"	"	2 9	2 10n	"

Abbreviations: N.—Nitrogen; P.A.—Phosphoric Acid; S.P.A.—Soluble Phosphoric Acid; Pot.—Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

l Prices for 6-ton lots f.o.r. Knottingley.

m In bags f.o.r. Liverpool. Fineness 45% through standard sieve.

n Carriage paid 4-ton lots London. In non-returnable bags, prices are 5s. per ton extra.

p Prices for 6-ton lots f.o.r. At Hull ground limestone 100% through standard sieve.

on the richer land. In the drier parts of the country the effect of applying the whole of the nitrogen in the seed bed with the other manures is as good as, or sometimes better than, reserving a proportion for top dressing. In wet areas, only the ammonia nitrogen can safely be used in this way.

Mangolds.—To get a paying crop heavy yields are necessary; and since the crop is probably more responsive to manures than sugar-beet, and there is no question of seriously depreciating the quality by heavy manuring, generous treatment is required. A good dressing of dung and artificials as for sugar-beet is a safe guide, but the nitrogen may well be increased up to 3 cwt. of sulphate of ammonia or its equivalent per acre; half with the seed and half as a top dressing. Here again the low-grade potash salts are an advantage, especially when nitrate of soda is not being used for top-dressing purposes.

Kales.—These leafy crops are becoming more important as an alternative to roots, which require more careful singling. They are very responsive to nitrogen, whose leaf-producing qualities are especially valuable for this plant. If the crop is dunged, there is still reason to give up to 2 cwt. of nitrogenous top-dressing, while, without dung, 3 cwt. is not too much. The nitrogen should be supported by a light dressing of phosphate and potash.

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NOTES ON FEEDING

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Early Summer Beef.—The figures quoted by R. J. Thompson in the last issue of this JOURNAL (March, 1932) page 1256, are of special interest to those engaged in the production of beef on grass land. He points out that prices are usually at their highest level in June, and that they gradually fall to the lowest point in November—the prices in the latter month being between 5s. and 7s. per live cwt. lower than in June. There is a gradual rise from November towards spring and in June again the price has reached a level 4s. or 5s. per cwt. higher than in February and March. On June 13 last, in the Northampton market, the best class of *store* cattle—Irish black-pollled heifers—made 55s. per cwt. live weight. These heifers have been sold fat in March at 50s. per cwt., which represents the top price current locally for the best class of beef. These figures correspond very closely to those given by Thompson. It is clear that, as far as may be possible, it is advisable to buy

stores in the autumn and to sell fat stock in June. To do so, however, suitable buildings, and some roots or other arable land crops, as well as hay, are generally required, and it is only to a limited extent that this procedure can be followed.

When turning out "fresh" or "forward" stores to grass, the not uncommon way, of simply putting them out on the first of May and leaving them on grass from then onwards, hardly seems to be the best practice. It is better to turn them out for a few hours daily, beginning about the middle of April, bring them in overnight for a fortnight or three weeks, and supplement the grass with hay and a small allowance of concentrates, the greater portion of these dry foods being fed, preferably, in the morning. In this way the stock gradually become accustomed to the grass and, aided by suitable supplementary feeding, young cattle will withstand the scouring tendency of much stronger pastures than they otherwise would.

Research has shown that fresh succulent grass in May is rich in protein. Theoretically, therefore, the correct concentrated supplement would be a food rich in carbohydrates. Established custom has favoured undecorticated cotton cake, which, because of its astringent properties and high percentage of fibre, has a binding effect which is widely recognized. Cotton cake, however, has not the correct balance, and recent practice has demonstrated that a combination of cotton cake and a starchy cereal gives possibly the more satisfactory results—say equal parts of cotton cake and kibbled barley or maize or oats.

Cubes are specially attractive for outdoor feeding and, because of their form, maize germ cubes have been favoured in certain grazing districts. A cube is more economical and convenient to handle than meal for use out-of-doors, but it is not always possible, unfortunately, to obtain maize germ cubes sufficiently low in oil to render them entirely suitable as a supplement to grass. A wheat feed cube composed of sharps and bran appears to merit trial. A cube that should generally fulfil requirements would be one made of sound and wholesome ingredients, possessing some astringent properties and sufficiently high in carbohydrates to balance the protein in grass. Such a cube is likely to give favourable results.

Forward stores that are intended for June beef must be kept steadily going ahead on grass. The younger the cattle, the more need there is for supplementary feeding to counteract the scouring effect of strong pastures; but young cattle are

likely to make the highest price current, namely, that for the "select" grade of beef. Whatever the age and grade of cattle, however, it is worth while bearing in mind that, as Thompson has shown, the June prices are those generally likely to be most favourable to the seller.

Chicken Feeding.—Various systems of chicken feeding are employed by those who practise up-to-date methods, but it cannot be claimed that any one system is best in all circumstances. The chicken rearer's first consideration is efficiency with economy; the aim being to secure a sufficiently good rate of growth in the early stages, and the ultimate development of the chicks into hardy mature stock, capable of standing the strain of egg production on the high standard that is expected of present-day laying birds. Labour-saving measures are also of primary importance. A system on these lines has been tested on the Institute farm and employed on many farms in this county; and, in view of the yields that birds so reared have given in the County Egg Laying Trials, it may be of interest to give details.

A seed mixture is fed morning and evening. Dry mash, *ad lib.*, is available in a dry mash hopper throughout the day. The following is the seed mixture for chicks up to the age of ten weeks :—

- 5 parts by weight cracked wheat
- 3 parts by weight cracked maize
- 2 parts by weight pinhead oatmeal

This mixture is given in the litter as a "scratch feed," but the quantity per head per day is restricted to just what the chicks will readily clear up in about five minutes. Care is taken to see that no food is left to lie amongst the litter from one feed to another. The dry mash is as follows :—

- $\frac{1}{2}$ part by weight fish meal.
- $\frac{1}{2}$ part by weight linseed meal.
- 2 parts by weight bran.
- 2 parts by weight sharps.
- 2 $\frac{1}{2}$ parts by weight Sussex ground oats.
- 2 $\frac{1}{2}$ parts by weight maize meal.

This mash is generally fed with separated milk, but if this is not available it is advisable to replace it with dried skim milk. The latter should be included at the rate of 5 per cent. in the dry mash, or, say, as $\frac{1}{2}$ part along with 10 parts of the mash mixture. Separated milk, both in the natural state and in the powdered form, is not only a valuable source of highly digestible protein but, in addition, makes the mash more appetizing and attractive, so that the chicks consume it more

greedily and with greater relish. Salt is added to the dry mash at the rate of 1 lb. per 100 lb. of the mixture, and fine limestone grit or oyster shell is provided separately. Several different seed mixtures have been tested, but the foregoing, which is both simple and comparatively inexpensive, has been found to give better results than more complicated mixtures, containing such ingredients as canary seed, millet, rice, etc., which are sometimes recommended. A larger proportion of cracked maize has been tried, but it was found that the chicks did not clear up the resulting mixture quite so readily, and were inclined to pick out the wheat and oatmeal in preference to the maize.

When chicks are fed on a seed mixture coupled with dry mash, it has been found necessary to include 2 per cent. cod liver oil in the mash, whereas when dry mash alone without a seed mixture is employed the cod liver oil may be restricted to 1 per cent. The greater quantity of mash eaten under the second method reduces the need for the higher percentage of cod liver oil. It is of importance, however, to see that early-hatched chicks, and particularly those kept intensively, receive a sufficient quantity of cod liver oil, otherwise there is danger of leg weakness and other troubles arising from malnutrition. To ensure that the cod liver oil is mixed thoroughly into the mash, it is found convenient and satisfactory to first rub the oil into the bran and then to mix the bran with the other ingredients. The inclusion of linseed meal in the mash is of advantage because it has a mild tonic effect and also aids the feathering of the young chicks.

For chicks 10 to 20 weeks old, the seed and dry mash mixtures are as follows :—

Seed mixture : two feeds daily, fed morning and afternoon or evening.

5 parts by weight cracked wheat.

5 parts by weight cracked maize.

Dry Mash

$\frac{1}{2}$ part by weight fish meal.

3 parts by weight bran.

3 parts by weight sharps.

2 parts by weight Sussex ground oats.

1 $\frac{1}{2}$ parts by weight maize meal.

When, at this stage, chicks are allowed free range, the cod liver oil may be reduced or, in fine sunny weather, discontinued. With those kept intensively, however, the cod liver oil is better continued at the same rate as for the younger chicks. The brand of cod liver oil is of importance as it would appear that the efficacy of the oil varies with different "makes."

Perhaps the best safeguard as to quality is the reputation of the firm whose "brand" it is. Some guidance is, however, available from scientific sources, and in the present state of knowledge of the matter it seems advisable to secure some guarantee that the oil shows not more than one "Red Unit," and not fewer than a minimum of seven "Blue Units." These may be regarded as indications of purity, and suitability for feeding for the provision of the required vitamins.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follow :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	7 2
Maize	81	6.8	5 7
Decorticated ground-nut cake	73	41.0	8 12
" cotton cake	71	34 0	8 5

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.63 shillings, and per unit protein equivalent, 1.63 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1931, issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

Crops	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 13
Oats	60	7 6	5 10
Barley	71	6.2	6 6
Potatoes	18	0.6	1 10
Swedes	7	0.7	0 13
Mangolds	7	0.4	0 12
Beans	66	20.0	7 0
Good meadow hay	37	4.6	3 8
Good oat straw	20	0.9*	1 14
Good clover hay	38	7.0	3 13
Vetch and oat silage	13	1.6	1 4
Barley straw	23	0.7	1 10
Wheat straw	13	0.1	1 1
Bean straw	23	1.7	2 0

* Obtainable from H.M. Stationery Office, Adelphi House, Kingway, W.C.2, price 6d. net.

DESCRIPTION	Price per qr.		Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	6 0	0 10	5 10	72	1 6	0-80	9-6
Barley, British feeding ..	—	—	6 15	0 8	6 7	71	1 9	0-94	6-2
" Persian	25 0	400	7 0	0 8	6 12	71	1 10	0-98	6-2
" Russian	26 0	"	7 5	0 8	6 17	71	1 11	1-03	6-2
Oats, English, white	—	—	7 13	0 9	7 4	60	2 5	1-29	7-6
" " black and grey ..	—	—	7 10	0 9	7 1	60	2 4	1-25	7-6
" Canadian No. 2 Western ..	24 0	320	8 13	0 9	8 4	60	2 9	1-47	7-6
" Argentine	19 9	"	6 18	0 9	6 9	60	2 2	1-16	7-6
" Chilean tawny	20 3	"	7 2†	0 9	6 13	60	2 3	1-20	7-6
" Russian	22 9	"	8 0*	0 9	7 11	60	2 6	1-34	7-6
Maize, Argentine	23 0	480	5 7	0 8	4 19	81	1 3	0-67	6-8
Beans, English winter	—	—	6 0‡	1 0	5 0	66	1 6	0-80	20
Peas, Indian	—	—	8 5†	0 17	7 8	69	2 2	1-16	18
" Japanese	—	—	29 0†	0 17	28 3	69	8 2	4-38	18
Dari	—	—	7 10†	0 10	7 0	74	1 11	1-03	7-2
Milling offals—									
Bran, British	—	—	6 15	0 19	5 16	42	2 9	1-47	10
" broad	—	—	7 12	0 19	6 13	42	3 2	1-70	10
Middlings, fine, imported ..	—	—	7 0	0 14	6 6	69	1 10	0-98	12
" coarse, British	—	—	6 12	0 14	5 18	58	2 0	1-67	11
Pollards, imported	—	—	6 0	0 19	5 1	60	1 8	0-89	11
Meal, barley	—	—	8 5	0 8	7 17	71	2 3	1-20	6-2
" maize	—	—	6 0	0 8	5 12	81	1 5	0-76	6-8
" " white S. African ..	—	—	5 15	0 8	5 7	81	1 4	0-71	6-8
" " germ	—	—	6 5	0 13	5 12	85	1 4	0-71	10
" locust bean	—	—	6 10	0 6	6 4	71	1 9	0-94	3-6
" bean	—	—	8 0	1 0	7 0	66	2 1	1-12	20
" fish	—	—	15 10	2 16	12 14	53	4 10	2-59	48
Maize, cooked flaked	—	—	7 5	0 8	6 17	83	1 8	0-80	8-6
" gluten feed	—	—	6 5	0 15	5 10	76	1 5	0-76	19
Linseed cake, English, 12% oil ..	—	—	8 15	1 4	7 11	74	2 0	1-07	25
" " " 9% "	—	—	8 7	1 4	7 3	74	1 11	1-03	25
" " " 8% "	—	—	8 2	1 4	6 18	74	1 10	0-98	25
Soya bean cake 5½% oil	—	—	8 7*	1 13	6 14	69	1 11	1-03	26
Cottonseed cake—									
" " English 4½% oil ..	—	—	5 7	1 3	4 4	42	2 0	1-07	17
" " Egyptian 4½% " ..	—	—	5 5	1 3	4 2	42	1 11	1-03	17
Decorticated cottonseed meal 7% oil	—	—	8 10*	1 14	6 16	74	1 10	0-98	35
Decorticated ground-nut cake, 6-7% oil	—	—	8 12	1 13	6 19	73	1 11	1-03	41
Palm kernel cake, 4½-5½% oil ..	—	—	6 15‡	0 14	6 1	75	1 7	0-85	17
" " " meal 4½% " ..	—	—	7 5‡	0 14	6 11	75	1 9	0-94	17
" " " meal 1-2% " ..	—	—	6 12‡	0 15	5 17	71	1 8	0-89	17
Feeding treacle	—	—	5 0	0 8	4 12	81	1 10	0-98	2-7
Brewers' grains, dried ale ..	—	—	6 15	0 15	6 0	48	2 6	1-34	13
" " " porter	—	—	6 5	0 15	5 10	48	2 4	1-25	13
Malt culms	—	—	6 10†	1 3	5 7	43	2 6	1-34	16
Dried sugar-beet pulp (a) ..	—	—	6 0	0 6	5 14	65	1 9	0-94	5-2

* At Bristol.

† At Liverpool.

‡ At Hull.

(a) Carriage paid on 4-ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of February, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 24s. per ton as shown above, the food value per ton is 55 16s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22·4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1·25s. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value of the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 3s. 10d.; P₂O₅, 3s. 7d.; K₂O, 3s. 2d.

MISCELLANEOUS NOTES

PRICES of agricultural produce in February were 17 per cent. higher than in the base years 1911-13, as compared with 22 per cent. in January and 26 per cent. a year ago. During the month

The Agricultural Index Number under review price changes were numerous, but the reduction of 5 points in the index

number was caused mainly by the lower prices for milk and potatoes, and a further decline in values for fat sheep.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1927 :—

Month				Percentage increase compared with the average of the corresponding month in 1911-13					
				1927	1928	1929	1930	1931	1932
January	..	..	..	49	45	45	48	30	22
February	..	..	..	45	43	44	44	26	17
March	..	..	..	43	45	43	39	23	—
April	..	..	..	43	51	46	37	23	—
May	..	..	..	42	54	44	34	22	—
June	..	..	..	41	53	40	31	23	—
July	..	..	..	42	45	41	34	21	—
August	..	..	..	42	44	52	35	21	—
September	..	..	..	43	44	52	42	20	—
October	..	..	..	40	39	42	29	13	—
November	..	..	..	37	41	44	29	12	—
December	..	..	..	38	40	43	26	17	—

Grain.—During January the average price for wheat fell by 2*d.* to 5*s.* 8*d.* per cwt., and that for barley by 1*d.* to 8*s.* 2*d.* The indices for both commodities were lower on the month, that for wheat moving downwards by 4 points to 24 per cent. below the level of the base years, while barley was 2 points lower, the relative index now standing at 1 per cent. above pre-war. The average for oats, however, rose by 3*d.* to 7*s.* 3*d.* per cwt., but as this increase was the same as that recorded in the base period, the index number was unchanged on the month at 2 per cent. above 1911-13. A year ago oats sold at 18 per cent. below pre-war.

Live Stock.—Quotations for live stock were mostly lower during the month under review. Fat cattle were a little dearer during February, but the index at 19 per cent. above 1911-13 showed no change on the month. Fat sheep, however, showed a further depreciation in value, quotations falling by $\frac{1}{2}$ *d.* per lb., and as the normal movement at this season of the year is for prices to advance, the effect of the rise in price during the base period and the fall during February was to

bring the index figure down by 10 points to exactly the pre-war level. At the corresponding period last year the index stood at 37 per cent. above pre-war. Bacon pigs were a little dearer during February, but as this increase was proportionately less than in the base period the index fell by one point to 5 per cent. below the level of 1911-13. Pork pigs were a shade cheaper on the month, and the index figure was 4 points lower at 6 per cent. above the base period. Quotations for dairy cows were about 10s. per head lower during the month under review, a downward movement of 2 points in the index number being recorded, but store cattle were dearer and the index figure rose by 2 points to a level of 23 per cent. above pre-war. Store sheep were a little dearer during February, but as this increase was proportionately smaller than that which occurred during the base period, the index fell by 4 points to 4 per cent. below the level of 1911-13. Store pigs also were cheaper on the month, the relative index moving downwards by 13 points to 14 per cent. above the base years. At the corresponding period last year sheep stood at 35 per cent. and pigs at 98 per cent. above pre-war.

Dairy and Poultry Produce.—The contract prices of milk during February were generally lower than in January, with a consequent downward movement of 8 points in the index figure to 46 per cent. above pre-war, as compared with 62 per cent. above at the corresponding period last year. Butter prices also were lower during February and the index showed a fall of one point, but cheese advanced 10 points to 32 per cent. above pre-war. Eggs were about 2½d. per dozen cheaper than in the previous month, and as this reduction was larger than that which occurred in the base period, the index fell by 5 points to 2 per cent. above 1911-13, or 15 points lower than in February, 1931. Fowls and ducks were a little dearer on the month, but geese were cheaper and the combined index figure for poultry fell by 4 points to 23 per cent. above the base level.

Other Commodities.—There has been some reaction from the high prices for potatoes ruling during January, and quotations for February show an average fall of about 20s. per ton. The index number has dropped by 28 points, but it still stands at the high level of 175 per cent. above pre-war. A year ago potatoes were selling at 73 per cent. above the level of 1911-13. Hay was 2s. 6d. per ton cheaper than in the previous month, and the index declined by 3 points to 28 per cent. below the base period. Most descriptions of vegetables were dearer

during February, and averaged 75 per cent. above pre-war. Wool was a little cheaper on the month and the index declined by 2 points.

Index numbers of different commodities during recent months and in February, 1930 and 1931, are shown below :—

Percentage increase as compared with the average prices ruling in the corresponding months of 1911-13

Commodity	1930	1931			1932	
	Feb.	Feb.	Nov.	Dec.	Jan.	Feb.
Wheat	21	31*	10*	14*	20*	24*
Barley	Nil	3	6	2	3	1
Oats	8*	18*	2*	1*	2	2
Fat cattle ..	37	25	15	10	19	19
„ sheep ..	56	37	13	6	10	Nil
Bacon pigs ..	95	31	12*	13*	4*	5*
Pork „ ..	99	51	2	3	10	6
Dairy cows ..	31	32	23	25	23	21
Store cattle ..	26	29	18	17	21	23
„ sheep ..	49	35	12	1	Nil	4*
„ pigs ..	135	98	29	20	27	14
Eggs	51	17	23	7*	7	2
Poultry ..	41	44	27	39	27	23
Milk	67	62	21	50	54	46
Butter	43	16	5	10	8	7
Cheese	39	19	6	11	22	32
Potatoes ..	14*	73	131	159	203	175
Hay	34	10*	22*	23*	25*	28*
Wool	18	25*	21*	21*	20*	22*

* Decrease.

* * * * *

DURING February, demonstrations in mole draining were given in Cambridgeshire and Surrey under the auspices of the

Ministry, the respective County Agricultural Education Authorities and the Mole Draining Demonstrations, Institute for Research in Agricultural Engineering, University of Oxford. Both 1932 demonstrations were well attended.

The demonstration in Cambridgeshire, on February 10 and 11, was held at the University Farm, near Cambridge, where four fields, covering, approximately, 50 acres, were drained. As tile mains were already in position at depths varying from 24 to 30 in., lateral mole drains were driven to cross these mains. The average depth of these subsidiary mole drains was about 15 in. when drawn by implements hauled direct by tractors, and 20 in. average depth where a winch and cable set was employed.

The Surrey demonstration, which completed the Ministry's programme of demonstrations in mole draining for this year, took place, on February 18 and 19, on the land of Mr. A. C. Ranson, Ivgley Farm, near Chiddingfold. Operations here were confined mainly to a grass field of about 19 acres. Two main drains were drawn about 23 in. deep, running to opposite sides of the field, and, from these, lateral mole drains were made at a depth, approximately, of 15 in. Where, in one part of the field, there was a fall away from the main drains, mole drains were drawn direct from a ditch.

* * * * *

Farm Workers' Minimum Wages.—Meetings of the Agricultural Wages Board were held at 7 Whitehall Place, London, S.W.1, on February 23 and March 8, 1932.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders.

Bedfordshire and Huntingdonshire.—An Order continuing, with a minor amendment in respect of the week in which Christmas Day falls, the operation of the existing minimum and overtime rates of wages for male and female workers from February 28, 1932 (i.e., the day following that on which the existing rates are due to expire), until February 25, 1933. The minimum rate in the case of male workers of 21 years of age and over is 30s. 6d. per week of 41 hours in the weeks in which Easter Monday and Whit Monday fall, 50 hours in any other week in summer, 39½ hours in the week in which Boxing Day falls and 48 hours in any other week in winter. The overtime rates in the case of male workers of similar age are 9d. per hour on weekdays, 10d. per hour on Easter Monday, Whit Monday and Boxing Day, and 11d. per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate is 6d. per hour with overtime at 7½d. per hour on weekdays, 8½d. per hour on Easter Monday, Whit Monday and Boxing Day, and 9d. per hour on Sundays.

Berkshire.—An Order fixing minimum and overtime rates of wages for male workers and minimum rates of wages for female workers to come into operation on March 5 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until December 31, 1932. The minimum rate in the case of male workers of 21 years of age and over is 28s. 6d. (instead of 30s. as at present) per week of 41 hours in the weeks in which Good Friday and Boxing day fall and 50 hours in any other week, with overtime at 8½d. per hour. In the case of female workers of 19 years of age and over the minimum rate is 5d. per hour for all time worked.

Buckinghamshire.—An Order cancelling as from March 5, 1932, the existing minimum and overtime rates of wages for male and female workers and fixing fresh rates to come into operation on March 6, 1932, and to continue in force until further notice. The minimum rate in the case of male workers of 21 years of age and over is 31s. per week of 51 hours in summer (instead of 50 hours as formerly, and 48 hours in winter, with overtime at 8½d. per hour on weekdays and 10d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day (instead of 9d. and 11d. per hour, respectively, as at present).

In the case of female workers of 18 years of age and over the minimum rates is 6d. per hour with overtime at 7d. per hour on weekdays and 8d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day (instead of 7½d. and 9d. per hour, respectively, as at present).

Devonshire.—An Order continuing with a minor amendment in respect of the week in which Boxing Day falls the operation of the existing minimum and overtime rates of wages up to March 25, 1933. The minimum rates in the case of male workers of 21 years of age and over are 32s. 6d. per week of 52 hours in summer, 41 hours in the week in which Boxing Day falls and 50 hours in any other week in winter with overtime at 8½d. per hour on weekdays and 10d. per hour on Sundays, provided that all overtime employment on the hay and corn harvests be paid for at the rate of 10d. per hour. In the case of female workers of 20 years of age and over the minimum rate is 5d. per hour for all time worked.

Durham.—An Order continuing until May 13, 1933, with certain modifications in respect of overtime rates, the minimum and overtime rates of wages at present in force. The minimum rates in the case of male workers of 21 years of age and over are: for horsemen who are householders, 32s. per week of 50 hours with, in addition, 7s. per week to cover all time customarily spent in attention to horses; for horsemen who are not householders and who are not boarded and lodged 31s. per week of 50 hours with, in addition, 3s. 6d. per week to cover all time customarily spent in attention to horses; for horsemen who are boarded and lodged 31s. per week of 50 hours and any additional time customarily spent in attention to horses. For stockmen or shepherds who are householders the minimum rate is 43s. per week; for stockmen or shepherds who are not householders and who are not boarded and lodged 36s. 10½d. per week and for stockmen or shepherds who are boarded and lodged 35s. per week, in each case for such hours as are customarily spent in attention to stock. The minimum rate for other male workers of 21 years of age and over is 31s. per week of 50 hours, except in the case of casual workers, when the rate is 6d. per hour. The overtime rate for all classes of male workers (other than casual workers) is 9d. per hour on Sundays, Christmas Day and Good Friday and after 12 noon on Saturday, and 8d. per hour for all other overtime employment. In the case of female workers of 18 years of age and over, the minimum rate is 2s. 6d. per day of 8 hours with overtime at 4d. per hour.

Essex.—An Order fixing the minimum and overtime rates of wages to come into operation on March 27, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until March 25, 1933. The minimum rate in the case of male workers of 21 years of age and over is 30s. per week of 43 hours (instead of 41½ hours as formerly) in the weeks in which Easter Monday and Whit Monday fall, 52 hours (instead of 50 hours as formerly) in any other week in summer, 41½ hours (instead of 39½ hours as formerly) in the week in which Boxing Day falls and 50 hours (instead of 48 hours as formerly) in any other week in winter with overtime throughout the year at 9d. per hour on weekdays and 10d. per hour on Sundays and on Boxing Day. In the case of female workers of 21 years of age and over the minimum rate is 5½d. per hour for all time worked.

Hampshire and Isle of Wight.—An Order continuing the operation of the existing minimum and overtime rates of wages for male workers and minimum rates of wages for female workers from

March 6, 1932 (*i.e.*, the day following that on which the existing rates are due to expire), until December 31, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30s. 6d. per week of 43½ hours in the week in which Good Friday falls, 53½ hours in any other week in summer, 40½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter, with overtime at 8d. per hour except in the case of carters, cowmen, shepherds or milkers, for overtime employment in connection with the immediate care of animals, when the overtime rate is 7½d. per hour. In the case of female workers of 18 years of age and over the minimum rate is 5d. per hour for all time worked.

Kent.—An Order continuing the operation of the existing minimum and overtime rates of wages for male and female workers from March 1, 1932 (*i.e.*, the day following that on which the existing rates are due to expire), until February 28, 1933. The minimum rate in the case of male workers of 21 years of age and over, employed wholly or mainly as horsemen, stockmen, or shepherds, is 33s. per week of 42½ hours in the weeks in which Good Friday and Christmas Day fall, and 52 hours in any other week with, in addition, 8d. per hour for all employment on customary duties in excess of those hours but not exceeding 60 hours in any week. In the case of other male workers of similar age the minimum rate is 32s. 6d. per week of 42½ hours in the week in which Good Friday falls, 52 hours in any other week in summer, 39 hours in the week in which Christmas Day falls and 48 hours in any other week in winter. For the purpose of the Order summer is defined as commencing on February 1 (instead of on March 1 as hitherto) and ending on October 31. The overtime rates in the case of all male workers of 21 years of age and over is 9d. per hour on weekdays and 10d. per hour on Sundays, Good Friday and Christmas Day. In the case of female workers of 18 years of age and over the minimum rate is 5½d. per hour with overtime at 1½d. per hour on weekdays and 7d. per hour on Sundays, Good Friday and Christmas Day.

Lincolnshire: Kesteven and Lindsey.—An Order continuing the operation of the existing minimum and overtime rates of wages for male workers and minimum rates of wages for female workers from March 7, 1932 (*i.e.*, the day following that on which the existing rates are due to expire), until March 5, 1933. The minimum rates in the case of male workers of 21 years of age and over are :—

WAGGONERS.—37s. per week of 61 hours during the period from October 15 to May 13 and 58 hours during the remainder of the year.

SHEPHERDS.—35s. per week of 55 hours in summer and 56 hours in winter.

STOCKMEN.—36s. per week of 56 hours in summer and 58 hours in winter.

OTHER MALE WORKERS.—30s. per week of 53 hours in summer and 48 hours in winter.

In the case of shepherds additional sums are payable in respect of employment during the lambing season in connection with the care of sheep.

The overtime rates in the case of all classes of male workers of 21 years of age and over are 9d. per hour on week-days and 11d. per hour on Sundays. In the case of female workers of 17 years of age and over the minimum rate is 5½d. per hour for all time worked.

Middlesex.—An Order continuing the operation of the existing minimum and overtime rates of wages for male and female workers from March 1, 1932 (*i.e.*, the day following that on which the

existing rates are due to expire), until February 28, 1933. The minimum rates in the case of male workers of 21 years of age and over are: *Stockmen* 41s. 3d. per week of 60 hours, *Carters* 38s. 6d. per week of 56 hours, *Casual Workers* 8½d. per hour and *other workers* 34s. 4½d. per week of 50 hours in summer and 33s. per week of 48 hours in winter, with overtime for all classes at 10½d. per hour. In the case of female workers of 18 years of age and over the minimum rates are for workers employed on the duties of *Stockmen* 30s. per week of 60 hours, for *Carters* 28s. per week of 56 hours, for *Casual Workers* 6d. per hour and for *other workers* 25s. per week of 50 hours in summer and 24s. per week of 48 hours in winter with overtime for all classes at 7½d. per hour.

Monmouthshire.—An Order fixing minimum and overtime rates of wages for male and female workers to come into operation on March 16, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until March 15, 1933. The minimum rate in the case of male workers of 21 years of age and over is 31s. (instead of 32s. as at present) per week of 54 hours in summer and 50 hours in winter, with overtime at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day. In the case of female workers of 17 years of age and over the minimum rate is 6d. per hour for all time worked.

Northants and Soke of Peterborough.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates to come into operation on March 20, 1932, and to continue in force until October 29, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30s. per week of 42½ hours (instead of 44 hours as at present) in the weeks in which Easter Monday and Whit Monday fall, and 52 hours (instead of 54 hours as at present) in any other week during the period of the Order. The overtime rates in the case of male workers of similar age are 9d. per hour on weekdays and 11d. per hour on Sundays, Easter Monday and Whit Monday. In the case of female workers of 18 years of age and over the minimum rate is 6d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays, Easter Monday and Whit Monday.

Oxfordshire.—An Order fixing minimum and overtime rates of wages for male workers and minimum rates of wages for female workers to come into operation on March 6, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until June 25, 1932. The minimum rate in the case of male workers of 21 years of age and over is 28s. (instead of 30s. as at present) per week of 41 hours in the weeks in which Easter Monday and Whit Monday fall, and 50 hours during any other week within the period of the Order. The overtime rates for male workers of similar age are 8d. per hour on weekdays and 10d. per hour on Sundays, Easter Monday and Whit Monday, these rates being in each case 1d. per hour less than those at present in force. In the case of female workers of 18 years of age and over the minimum rate is 6d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays, Easter Monday and Whit Monday.

Sussex.—An Order continuing the operation of the existing minimum and overtime rates of wages until April 9, 1933. The minimum rate in the case of horsemen, cowmen, stockmen or shepherds of 21 years of age and over is 36s. per week of 50 hours in the weeks in which Good Friday, Whit Monday and Boxing Day fall and

58 hours in any other week. In the case of other male workers of similar age the minimum rate is 31s. per week of 44 hours in the weeks in which Good Friday and Whit Monday fall, 52 hours in any other week in summer, 40 hours in the week in which Boxing Day falls and 48 hours in any other week in winter. The overtime rates in the case of male workers of 21 years of age and over are 9d. per hour on weekdays and 10½d. per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

Wiltshire.—An Order continuing, with minor amendments in the case of overtime rates, the operation of the existing minimum and overtime rates of wages for male workers and minimum rates of wages for female workers from March 6, 1932 (i.e., the day following that on which the existing rates are due to expire), until December 31, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30s. per week of 41 hours during the weeks in which Good Friday and Boxing Day fall and 50 hours in any other week with overtime at 8d. per hour except for overtime employment on the hay and corn harvests, when the rate is 9d. per hour. In the case of female workers of 18 years of age and over the minimum rate is 5d. per hour for all time worked.

Glamorganshire.—An Order fixing minimum and overtime rates of wages for male and female workers to come into operation on March 2, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until March 1, 1933. The minimum rates in the case of male workers of 21 years of age and over are for stockmen, cattlemen, cowmen, horsemen, shepherds and bailiffs, 35s. (instead of 39s. as at present) per week of 60 hours, with overtime at 10d. per hour (instead of 11d. per hour as at present) and in the case of other male workers of similar age 31s. 6d. (instead of 35s. as at present) per week of 52 hours in summer and 48 hours in winter, with overtime at 9d. per hour on weekdays and 10d. per hour on Sundays (instead of 10d. and 11d. per hour, respectively, as at present). In the case of female workers of 18 years of age and over the minimum rate is 6d. per hour with overtime at 7d. per hour on weekdays and 7½d. per hour on Sundays.

Copies of the Orders in full may be obtained, free of charge, on application to the Secretary of the Agricultural Wages Board.

* * * * *

Enforcement of Minimum Rates of Wages.—During the month ended March 14, legal proceedings were instituted against five employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County	Court	Fines		Costs		Arrears of wages		No. of workers involved
		£	s.	d.	£	s.	d.	
Hereford ..	Ledbury .	*	—	—	—	—	—	2
Monmouth .	Chepstow	—	—	3 11 0	40	0	0	1
Nottingham	Worsop	0 12 6	—	—	18	0	0	2
Stafford ..	Cannock .	2 0 0	2 1 0	—	70	19	10	2
Yorks, W.R.	Sedburgh	†	0 10 0	—	8	7	7	1
		£2 12 6	£6 2 0	£137 7 5				8

* Case dismissed. † Dismissed under Probation of Offenders Act.

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NOTES FOR THE MONTH

THE inception of the Agricultural Meteorological Scheme in 1924 was the first serious large-scale attempt in this country to collect crop and weather data with the object of their subsequent correlation. It was realized at the outset that the climate affecting the plant was that of its immediate environment. It was obviously impracticable, however, to attempt to measure the components of the "climate" within the folds of the plant's leaves and the petals of its blossoms, nor would any attempt to have done so been justified, because the technique of collecting crop data had yet to be developed.

The Micro-Climate of Plants

As a beginning it was decided that the Crop Weather Stations should collect meteorological data in accordance with the practice of the climatological stations of the Meteorological Office, and that the crop observations should consist mainly of such general phases of the plant's development as brairding, tillering, earing, blossoming and fruiting. A statistical examination of data collected on these lines for five years revealed that, apart from the suitability of the data collected, the precision with which the crop observations were being made was in no way comparable with that with which the meteorological factors could be observed, and that therefore, from the statistical point of view, the crop data left something to be desired.

For this reason a precise scheme of observations on wheat, known as the "Wheat Precision Scheme," was formulated, and the Ministry arranged for its adoption at six of its Crop Weather Stations. This marked a definite step in the development of the technique of crop observation, and it was now open to question whether the meteorological data would be suitable for correlation with this precise crop data.

At the Conference of Empire Meteorologists in 1929 the Agricultural Section passed two resolutions regarding the collection of meteorological data. One expressed the opinion that the month was too long a period for the purpose of

summarizing for publication statistics of agricultural meteorology, and that weekly summaries should be adopted. As a result of this resolution, the week, for the purpose of the Agricultural Meteorological Scheme, became the meteorological unit as from the beginning of 1931. The other resolution drew attention to the fact, already realized, that the local climate of the plant or insect in an agricultural crop, or elsewhere, might be markedly different from that obtaining in the meteorological screen. The Conference was of opinion that valuable service to agriculture could be rendered by the formulation of standard methods for adoption in the systematic recording of these local climates.

As a result of this resolution the Agricultural Meteorological Committee appointed a special sub-committee known as the Local Climates Sub-Committee to investigate the question raised. The first step taken by this Sub-Committee was to circularize a questionnaire to individual workers and research centres throughout the Empire. Nearly 200 questionnaire forms were distributed, but only sixty replies were received, and of these only one-fourth could be said to contain any useful information. It was quite clear that very little work was being done in connexion with the study of local climates, and that, while workers were waiting and anxious to receive help, they were not yet in a position to give it.

The Sub-Committee, realizing that any scheme that it might suggest must be of a pioneer nature, made certain tentative suggestions. Subsequently, intimating that it was in a position to supply certain apparatus and that the Meteorological Office was prepared to lend other apparatus, the Sub-Committee asked the Director of the Rothamsted Experimental Station whether it would be possible to put such a scheme into operation at that station. At the time that this request was received by the Rothamsted Experimental Station, it so happened that Dr. Keen was about to carry out certain experiments regarding the influence of crop cover on the soil temperature, and the station formulated a scheme that would meet the purposes of both Dr. Keen and the Local Climates Sub-Committee.

The scheme, which immediately met with the approval of both the Sub-Committee and the main Agricultural Meteorological Committee, provides for the measurement of the temperature and humidity of the air at three positions of the crop, the temperature of the soil below the crop at depths of 4 in., 8 in. and 1 ft., the moisture content of the soil and the

CO₂ content of the air within the crop, whilst, for the purpose of comparison, similar observations are made outside the crop. The thermal and hygrometric observations are made by means of self-recording apparatus. The scheme is under the supervision of Dr. Keen and is being carried out with the utmost scientific precision. It has been in operation since the middle of last March, and in due course should show definitely one of three things: (1) that there is a negligible difference between the environment of the crop and that of the Stevenson screen (which is very improbable); (2) that the local climate is incapable of correlation with conditions outside the crop; or (3) that there is a definite correlation between the two climatic environments, in which case a suitable correction factor, according to crop, would need to be applied to the observations as made at present, in order to obtain the information required regarding the climate of the plant's environment. Even after a single season's working the scheme should yield some very interesting data.

Some confusion has been occasioned by the use of the term "local climate," which has been thought to refer to the climate of a comparatively large area. Micro-climate, whilst admittedly a misnomer, is now generally understood in European countries, and the present scheme will be known as the "Micro-climate Investigation."

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THE following note has been communicated by Mr. J. T. Quinton, formerly Chief Sanitary Inspector, Liverpool:—

The idea of organizing milk clubs in schools on Merseyside may be said to date from a visit to the City of Liverpool by Mr. Wilfred Buckley, C.B.E., in the early part of the year 1928. Mr. Buckley, who is well known as one of the pioneers in the production of clean milk, gave a lecture on "Milk Production" in Liverpool. The meeting created interest amongst members of the dairying industry in the City, and as a result a committee was formed from different branches of the milk industry representing dairymen's associations, cow-keepers' associations, co-operative societies, etc., to promote a wider knowledge of milk, its value and uses, from every angle, including its valuable health properties. The committee considered that the formation of milk clubs in schools—a movement which was becoming prominent—was one of the best means of promoting their ideals, and in order to further these objects arrangements were made with the National Milk

Publicity Council in 1928 for the services of one of their experienced lecturers. This officer from the outset secured the interest of the Medical Officer of Health and of the Director of Education in the movement. Visits were then paid to several schools for the purpose of interviewing the head teachers and explaining the purport of the scheme. The interest of many teachers was aroused and large numbers of leaflets were distributed to the school children. The last page of the leaflet was perforated in order that the form shown below might be detached and completed.

MILK CLUB IN YOUR CHILD'S SCHOOL

Arrangements have been made to start a milk club in this department of the school, and your child can buy for ONE PENNY one-third of a pint of milk. The milk will be delivered in a sealed bottle and the child supplied with a straw through which to drink it.

If you wish your child to have milk, please sign, tear off, and return this slip to the Head Teacher.

.....

I wish my child to have milk at school, and I am willing to pay one penny per day for same.

Signature

Address

Date

Representatives of social, political and industrial organizations were interviewed in order to widen the field of interest, and arrangements were made for addresses to be given to the members of these bodies in order to establish closer contact with the parents of school children.

The first Milk Club was formed in October, 1928, with 60 members, which number was soon increased to 120. In the meantime other schools were beginning to take up the scheme, and a sub-committee was appointed to deal with their applications and to arrange for supplies from suitable and conveniently located dairymen or producers.

The milk was supplied in $\frac{1}{2}$ -pint bottles, fitted with special discs through which a sterilized straw could be inserted, in order that, by consuming the milk slowly, the greatest benefit might be derived by the children. The cleanliness and the quality of the milk supplied were ensured through the supervision of the Health Department.

The success achieved through the efforts of the committee may be gauged from the fact that, in June, 1929, less than 12 months after its formation, the number of children taking part in the scheme had increased to 30,000.

The following notes by the Medical Officer of Health in his annual report for 1928 form an interesting commentary on the scheme :—

"The great value of milk from the standpoint of nutrition is becoming more and more appreciated, and in several of the schools the teachers have made arrangements whereby children can obtain milk . . . during the morning sessions at cost price.

"One Head Teacher has kindly supplied information with regard to a scheme which she has introduced with success at her school. Every morning, during play-time, some 120 girls are given one-third of a pint of milk each, which is supplied in bottles the stoppers of which are made of cardboard and capable of being perforated in the centre by a straw provided and through which the milk can be drunk, thus obviating the use of cups.

"The children pay for the week's supply on the Monday mornings. The children have been weighed every month and with four exceptions gained considerably in weight : five have gained 7-9 lb. and one as much as 12 lb. in less than six months."

A great step forward was the appointment to the committee of representatives from the other Merseyside Boroughs. Deputations from the enlarged committee then waited upon the Health and Education Departments of the new areas, and in every case the scheme was well received and promises of support were forthcoming. The head teachers in the schools of Birkenhead, Bootle and Wallasey were approached, and became so actively interested that in a comparatively short time the number of milk clubs had been increased to about 300, the highest number of children taking part being about 50,000. This number of children represents a weekly supply of 250,000 bottles, and in a school year the total consumption would amount to 10,000,000 bottles, or nearly 400,000 gallons of milk.

In the latter part of 1931 another lecturer from the National Milk Publicity Council was sent to the Merseyside area, and lectures and demonstrations were organized through the co-operation of Local Authorities, School Committees and social and industrial organizations. This development is of immense importance in providing a ready means of educating the general public on the value of milk and the necessity of securing an increase in consumption.

At the present time, arrangements are being made to strengthen the committee by the inclusion of representatives of the Health and Education Departments and thus to bring about closer co-operation between all concerned in the production, distribution and consumption of clean and pure milk, in the knowledge that a greater consumption of milk will build up the school children and fortify them against the

dangers to which, in the past, so many have fallen victims through lack of adequate nutrition.

It is interesting to note that the number of children receiving milk through clubs organized by the committee represents about one-sixteenth of the total number (800,000) concerned throughout the country.

NOTE.—It should be mentioned that much of the success which has attended the Merseyside Milk Movement is due to the initiative, enthusiasm and hard work of Mr. Quinton himself.

* * * * *

THE importance of land drainage has been repeatedly emphasized in this JOURNAL. Not only may the fertility of arable land depend largely on efficient draining, but the drainage of grass land, especially of wet or waterlogged areas, is an essential means of preventing or checking the incidence of certain animal parasites that, thriving in damp situations, are the cause of heavy losses among stock.

The Efficient Working of Land Drains

An adequate drainage system, however, is of little avail unless maintained in good working order. It is too often assumed that, once the drains are installed, they require little or no subsequent attention. To ensure good working, periodical cleaning out of ditches and keeping drain outfalls clear of obstruction are recognized as elementary precautions; but it must also be borne in mind that land drains may become blocked in their courses by the intrusion of plant or tree roots and by the ingress of debris. Mr. J. R. Bond, the County Organizer for Derbyshire, reports an instance, in his county, of the roots of sugar-beet having penetrated and completely blocked a main drain 6 ft. deep. Regular inspection of the outfalls during wet weather is desirable, therefore, to ascertain whether the flow is proportionate to the amount of rainfall: if it is not, some obstruction may be suspected.

Point is given to this last matter by a recent experience on the farm of the Midland Agricultural College, communicated by the Principal, Dr. Milburn. This shows how quickly a drainage system may be thrown out of gear by some hidden and unsuspected cause.

In January, 1931, two existing drains converging in a hollow, and a new main laid between them, were made to empty into a catchpit. The land was arable and had been used, during the war, as a sewage ground for a hutment camp, the soil being a medium gravelly loam. It had been

cropped with mangolds in 1930 and oats in 1931. From the catchpit, a 4 in. main was relaid to a ditch about 50 yards distant. To ensure ample drainage-capacity from the catchpit and to secure greater fall, a new 4 in. main was laid diverging from the other one and discharging into the ditch about 20 yards lower down. In February this year (1932) it was noted that neither of these 4 in. outfall mains was discharging more than a dribble, although, from the amount of the rainfall, both should have been running freely.

Inspection of the outlets showed that nettle roots had penetrated between the joints of the first few pipes from the ditch, which is 3 ft. 6 in. deep. The intrusion of the nettle roots was not unprecedented, as it is well known that many plants (willows especially) will grow into and ultimately cause a complete block in a drainage system. These nettle roots, however, had branched and rebranched, and were mixed with other fibrous root material, forming a matted growth like a bunch of human hair. This other fibrous material was more difficult to account for. There was a quantity of it in the catchpit and on the brickwork forming it; small quantities could also be drawn with rods from the three drains running into the catchpit; and the rodding of the two 4 in. outfall mains from the catchpit (50 yd. and 60 yd., respectively) produced a bucketful of the matted material from each. It had the appearance of a growth of algæ, but was dark-brown to black in colour.

Examined microscopically by Messrs. Roebuck and Holden, of the College staff, it was found to consist of long, thin, dead root fibres together with a protozoan growth that, associated with decaying vegetable matter, sometimes gives trouble on sewage farms and watercress beds. From this, it would seem that there is some plant (or plants) on the arable land, the roots of which penetrate through the medium gravelly loam and through the joints into the drain pipes, which are 2 ft. 6 in. below the surface; and it has been assumed that these deep root-fibres, severed from the plant by periodic ploughings, were washed down into the drains, and that, meeting the nettle roots near the outlets, they caused a complete stoppage of the two outfall mains within the short space of a year.

To remedy the trouble, the outfall ends of the mains have been replaced, for a distance of 6 ft. or 9 ft., by glazed, socketed pipes, cement-jointed, and it is hoped that the penetration by nettle rootlets will thus be prevented, and that the dead root fibres from the higher reaches will then be flushed into

the ditch when the drains are running freely. This rapid blocking of the two independent outfall mains from the same catchpit shows, however, how exceedingly important it is to keep close watch on drainage outlets; and it is hoped that this experience at the College will prompt others responsible for land-drainage systems to examine outlets to discover whether the drains are running freely.

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In the May, 1931, issue of this JOURNAL, Mr. E. T. Sykes, B.A., of the Norfolk Agricultural Station, gave an account of four years' trials (1927-30), carried out

Applying Nitrate of Soda to Sugar-Beet at the Station, on the application of nitrate of soda to sugar-beet. The conclusion drawn from these trials was that as good results could be obtained by applying

the whole of the nitrate of soda dressing in one dose to the seed-bed as by applying the dressing in two doses, one-half to the seed-bed and the other half in the form of a top-dressing immediately after singling. The efficiency of the nitrate of soda, applied in one dose to the seed-bed, was not affected by the amount of rain falling at and after seeding.

Mr. Sykes has now communicated the following particulars of a further trial in 1931, a year in which, he states, an abnormal amount of rain fell in Norfolk during the months of April, May, June and July. For the months of April, May and June, the total rainfall was 9.45 in. (the normal for these three months is 5.33 in.) which was considerably in excess of the amounts that fell in these months in any one of the preceding four years. During July, there were 3.24 in. of rain, compared with the normal for the month of 2.66 in. It is thus evident that the year afforded a particularly good test of the efficiency of nitrate of soda for seed-bed application, giving conditions in which considerable leaching of nitrogen out of the soil might reasonably be expected. The year was all the more appropriate because the field on which the trial was carried out was a light loam.

As in previous years, all the plots received a basal dressing of farmyard manure, phosphate and potash. On account of the inclement weather, the seed was drilled comparatively late (May 7), but the young plants made rapid growth, and were singled on June 11. An attack of black aphid at the beginning of July did some damage, but the beet had recovered by the end of the month. The relatively wet season and the lack of sun caused the beet to be late in ripening, and

it was thought that the opportunity should be taken to obtain further information as to the effect of seed-bed application of nitrate of soda on maturity in a late season. Accordingly one-half of each plot was lifted at the beginning of October and the remainder left until the beginning of December. The yield of washed beet, percentage of sugar, and yield of sugar per acre at the two liftings were as follows :—

	<i>Yield of washed beet per acre</i>				<i>Percentage of sugar</i>		<i>Yield of sugar, cwt. per acre</i>	
	Oct. 6	Dec. 7	Oct. 6	Dec. 7	Oct. 6	Dec. 7	Oct. 6	Dec. 7
	tons	cwt.	tons	cwt.				
3 cwt. nitrate of soda on seed-bed	12	2	14	12	16.8	17.2	40.6	50.3
1½ cwt. nitrate of soda on seed-bed ; 1½ cwt. nitrate of soda at singling	12	5	14	18	16.5	17.0	40.4	50.7
Control. No nitrate of soda	10	12	12	10	16.5	17.4	34.4	43.5
Standard error	0.31 tons		0.33 tons		—	—	—	—

It will be seen that, at both liftings, there was no significant difference in yield or sugar-content between the plots receiving nitrate of soda irrespective of when it was applied. The seed-bed application thus did not hasten or delay ripening to any extent. It is interesting to note the increase in yield and in sugar-content during October and November, indicating that the beet were making growth all through the lifting season.

These figures confirm those obtained in the previous four years' trials, and, as has been indicated above, they are especially interesting when the abnormal rainfall is considered. In the five years of the trials, the total rainfall for the three months April, May and June has ranged from 2.94 in. in 1929 to 9.45 in. in 1931, with intermediate amounts in the other years. In none of the years has any difference been obtained in yield or in sugar-content, when 3 cwt. nitrate of soda is used all on the seed-bed, or when one-half is applied on the seed-bed and one-half is given as a top-dressing later. It would appear, therefore, that however great may be the rainfall during the first few weeks in the life of the beet crop, there is no serious loss of nitrogen from the nitrate of soda when it is all applied on the seed-bed ; or the loss is at least neutralized by the benefit to the plants of early application.

That this is so is emphasized by the results of the 1931 trial. The rainfall in April and May in that year was 3.31 in. and 4.30 in. respectively, i.e., over twice the normal in both months. The high April rainfall indicated that there was ample moisture in the seed-bed when the seed was drilled. There was also heavy rain in May, i.e., while the seeds were germinating and before the young plants could make use of the nitrogen in the soil. It would be expected, therefore, that in these conditions especially there would be loss of nitrogen from the nitrate of soda applied to the seed-bed, but the yield figures show that this, if it actually occurred, did not adversely affect the crop.

There is one further point that was not dealt with in the previous years' trials, namely, the question of the influence of seed-bed application on the yield of tops. In none of the years has there been any observable difference in the size of the tops, and this was confirmed in 1931, when the yield of tops at the October lifting was determined. Actually the yield of tops on the top-dressed plots was slightly higher than that from the seed-bed application plots, but the difference was small and not significant.

Further experience in the use of nitrate of soda for sugar-beet in the unusually wet year of 1931 has produced no evidence to show that the whole should not be put on to the seed-bed, even when both early and late liftings are considered.

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THE following paragraphs regarding the scheme in operation in New Zealand for the certification of white clover seed are

abstracted from the *New Zealand Journal*

New Zealand *of Agriculture* for November, 1931:—

Wild White "During last season white clover seed

Clover Seed harvested from pastures five years old
or over has been eligible for certification

as 'Old Pasture.' Much of the seed has been derived from the dressings of rye-grass from old pastures, the rest being from areas closed up specifically for the production of white clover seed."

"The demand in the past has been for seed from old pastures, the assumption being that such seed would most likely represent a more permanent strain than that from young pastures. It has now been established that while some old pasture seed is of a very permanent leafy type, other pastures are old because conditions have been favourable for reseeded. There is in New Zealand a regional strain of great persistence

and winter growth combined with abundant dense and leafy foliage. It is this strain which has no doubt been responsible for the overseas demand for New Zealand white clover. These facts having been established, the Department has now decided to discontinue the 'hit or miss' certification of old pastures, and to substitute the certification of the regional strain, which, although representing only about 10 per cent. of the seed harvested, has been responsible for the popularity of New Zealand white clover abroad. Certification of this strain under the name of 'N.Z. White Clover' is to commence in 1932, and certification of 'Old Pasture' will be discontinued."

The effect of this latest decision as to nomenclature seems to be that the most persistent and valuable type is, in future, to be known as "N.Z. White Clover," not as "old pasture" seed, nor even as "N.Z. *wild* white clover." This is likely to prove confusing in this country unless the position is clearly appreciated, since English agriculturists and seedsmen usually speak of Dutch or "ordinary" white clover as "white clover" and distinguish between this seed and wild white clover.

The change of name will not affect this season's purchases, but will begin to operate in the following year. After this year, therefore, purchasers who wish to get New Zealand certified seed will need to bear this point in mind. Supplies of this certified seed, which is distinctly more valuable in this country than other strains of New Zealand white clover, will probably be rather short for the first few seasons.

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THE Musk Rat, which is a native of North America, is a very prolific animal that, when at liberty, causes extensive damage to river banks and water courses

The Musk Rat by burrowing in the former and building obstructions in the bed of the latter, after the fashion of the beaver. It also causes damage to agricultural crops, fresh-water fish and molluscs, and may attack small live stock.

In the exercise of the powers conferred on the Minister of Agriculture and Fisheries and the Secretary of State for Scotland under the Destructive Imported Animals Act, 1932, an Order has been issued prohibiting, as from May 1, 1932, the importation into or keeping of Musk Rats in Great Britain except under licence granted by the Minister as respects England and Wales and by the Department of Agriculture for Scotland as respects Scotland.

The Minister and the Secretary of State have issued Regulations laying down the conditions under which licences to import and keep Musk Rats will be granted, and full particulars may be obtained on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1, or the Secretary, Department of Agriculture for Scotland, Queen Street, Edinburgh.*

Under the Act of 1932, an occupier of land on which Musk Rats are at large is required under penalty to give notice forthwith to the Minister or to the Department, as the case may be, and in view of the damage caused by these animals when at liberty, farmers and members of the public generally are asked to co-operate by killing any Musk Rats that may be found at large, or by notifying the Ministry of Agriculture and Fisheries or the Department of Agriculture for Scotland of the locality where any Musk Rat may have been seen.

Apart from the penalties to which a person is liable on conviction for importing or keeping Musk Rats without a licence, the Act makes it an offence for any person to turn loose any Musk Rat or wilfully allow a Musk Rat to escape.

A pamphlet containing a photograph of a Musk Rat, with further particulars enabling the animal to be identified, together with details of the provisions of the Act of 1932, has been prepared, and copies will be issued shortly, obtainable on application to the Ministry and the Department of Agriculture for Scotland at the addresses stated above.

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THE following note has been communicated by the National Institute of Agricultural Botany :—

<p>Mangolds and Swedes</p>	<p>Farmers have not yet forgotten the controversy over the value of root crops, but whatever effect that picturesque campaign or the competition of sugar-beet tops and pulp has had in reducing the area under mangolds and swedes, these crops remain of first-rate importance. Moreover, in few crops are there so many named strains. Some years ago the National Institute of Agricultural Botany collected 178 stocks of mangolds and 114 of purple-topped swedes. No institution has the resources to test such numbers simultaneously, but some of the most promising have now been through trials in different districts and the Institute</p>
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* Copies of the Order (S.R. & O. No. 153 of 1932) and of the Regulations (S.R. & O. No. 154 of 1932) may be purchased directly through any bookseller, or from H.M. Stationery Office, Adastral House, Kinzsway, London, W.C.2, price 1d. or 2d. net per copy, respectively.

has just issued its first recommendations in the form of a leaflet (free on request). It is abundantly clear that there are big differences between varieties; cheap seed of unproved sorts is often a very poor bargain.

Ideal was the outstanding mangold, owing to its high yield of dry matter per acre. Dry matter is the best measure of feeding value, and the fact that Ideal provides this in concentrated form and large quantities means that the farmer gets more value for less work if he grows this variety. Large Orange Globe and Lord Warden gave the next best yield of dry matter, though Lord Warden depended for this result mainly on the size of its root, which means more carting. The fine-topped variety of Yellow Globe, Red Intermediate and New Century all showed merit. Golden Tankard is a good keeper and individual roots have a high feeding value, but its yield per acre is too low to make it worth growing.

Swedes are interesting because they show definite adaptation to environment. The globe bronze-top type, as represented by Gateacre, the globe green-top, represented by Conqueror, and two purple-top globes, Acme and Purple King, have all done well in the south of England. Further north globe purple-top, Best of All, gave the best results; it also did well in the east, but there Purdy's Purple-Top gave even better results.

Farmers will hardly go far wrong if they follow these hints as far as the varieties named here are concerned. There are, however, numerous other varieties that have not yet been tested, and it may well be that some of them are as good as any of those named above. Growers, however, will be wise to ask for proof of performance before choosing a variety, and remember that what helps the bank balance is not total yield, nor show-roots, but dry matter per acre.

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THE following note has been communicated by Professor Raymond T. Parkhurst, B.Sc. (Agric.), M.Sc., National Institute of Poultry Husbandry, Harper

Egg Size Improved by Feeding Adams Agricultural College: Small eggs are much more difficult to dispose of than large ones, and it is not usually possible to obtain the proportionate value for them. The egg weighing 2 oz. is generally regarded as of standard weight for the market. Every producer should endeavour to manage his flock so that the birds produce the least possible number of eggs below this size. The best way to prevent small eggs reaching the market is not to produce them.

Although breeding may be an important factor in determining egg size, feeding also plays an important part in the matter. Closely related to feeding is the management of the birds, especially during the rearing season. Any cause that checks the healthy development of the pullet must result in the production of fewer eggs of good size. Satisfactory growth in the early life of the chicken depends upon adequate supplies of protein and minerals. During the later stages of development less stimulating foods are advisable.

There is probably little or no relation between egg weight and the number of eggs produced, provided the ration and management are correct. In other words, the fact that a bird produces a large number of eggs does not necessarily mean that these must be small. Most producers do not realize this. It has been shown, for example, that when rations containing meat meal are compared with similar rations in which unlimited sour skim-milk is the sole source of protein, the hens on sour milk not only lay more eggs, but also larger eggs. In a comparative experiment over six successive years at the Idaho Agricultural Experiment Station, the "sour skim milk" pen averaged 164 eggs and the "meat meal" or "meat scraps" pen only 116. The milk pen produced a larger percentage of large eggs and a smaller percentage of small eggs. Here are the figures:—

	PERCENTAGE OF ALL EGGS LAID WEIGHING :		
	24-28 oz. per dozen	22-24 oz. per dozen	— 22 oz. per dozen
Sour skim milk	45.0	37.1	17.9
Meat meal or meat scraps	26.7	41.3	32.0

The egg producer who can give his layers an unlimited amount of sour skim milk is fortunate.

Animal protein foods have been shown to be superior to vegetable protein foods in most experiments. A restriction of the quantity of food that is eaten and also a reduction of the consumption of calcium carbonate may cause small eggs. There are also indications that the amount of animal protein in the ration is important. When a high protein meat meal was compared with a low protein meat meal the former gave larger eggs. Green foods, such as sprouted oats, lawn clippings, kale or cabbage have been shown to improve egg size. Moist mash and warm water during the winter months may also be helpful. It seems reasonable to expect that limiting water consumption would limit egg size.

DRIED SUGAR-BEET PULP FOR PIGS

T. S. WRIGHT, N.D.A.,

Harper Adams Agricultural College, Newport, Salop.

To secure a return on capital in times of agricultural depression, it is essential for the farmer, without sacrificing efficiency, to reduce expenses wherever possible. In animal husbandry, feeding costs usually offer the greatest scope for economy, and the wider the choice of suitable feeding stuffs, the greater is the possibility of effecting a saving. Any addition to the number is, therefore, likely to be helpful. There has been little opportunity for economy, however, in recent years, as wheat offals have been a relatively expensive item in pig-feeding and the choice of suitable alternatives rather limited.

What is required as a substitute for "sharps" is a food that, without being too fibrous, gives a desirable degree of bulk in the ration. From this point of view, dried sugar-beet pulp seemed to offer possibilities, and, to test its suitability for pig-feeding, the experiment here described was carried out in 1929 at the Harper Adams College Experimental Station. The "plain" (unsweetened) variety of pulp only was used in the experiment, as it was feared that the laxative tendencies of the molassed pulp might introduce undesirable complications.

Chemical analyses of sharps and sugar-beet pulp show that they contain similar proportions of soluble carbohydrates, but differ in their other ingredients, sharps being the richer in oil and the poorer in fibre and ash (0.4 per cent.). The low oil-content of the beet pulp should tend to give a hard, dry fat and may be reckoned, therefore, as an advantage; but its high fibre content (17.5 per cent.) would naturally have been regarded as a disadvantage had not the Cambridge digestion trials shown beet-pulp fibre to be well digested by pigs. The one real defect in the beet pulp, as compared with sharps, is its lower protein content. This deficiency was made good in the experiment by including in the beet-pulp ration a small extra amount of a nitrogenous feeding stuff (soya meal).

Details of the Experiment.—For the purposes of the experiment, three lots of 10 pigs each were used, with the following differences of feeding:—

Lot I. Sharps included in ration; no beet pulp.

Lot II. Beet pulp included in ration; no sharps.

Lot III. Neither sharps nor beet pulp included in ration.

Apart from these differences the foods used were the same for all lots.

The 30 pigs were Large Whites, all home-bred and by the same sire. Their average age at the start was 15 weeks, and their average weight approximately 54 lb. The feeding period covered a space of four months, from August 27 till December 17, 1929, during which time wheat offals were about 43s. 4d. per ton dearer than dried beet pulp.

Recording of Weights.—Each pig was weighed individually at weekly intervals before the morning feed, when it had fasted for 13 hours. The initial and final weights were determined by taking the mean of the weighings read on three successive days. Sufficient food for 24 hours was weighed out separately each day for the respective lots and mixed at 8 a.m. to allow the meal ample time in which to soak.

Management.—All three lots were treated in precisely the same way, that is, when feeding thrice a day became necessary for the pigs receiving beet pulp, the remainder received their rations in a like manner. After the first six weeks, each lot was divided and penned as two groups of five. A small allowance of greenstuff was provided daily, and the stock were exercised in yards for 20 or 30 minutes a day to maintain a healthy condition.

The Rations were as follows :—

At the commencement :—

	Lot I per cent.	Lot II per cent.	Lot III per cent.
Barley meal	55	48	80
Sharps	30		
Beet pulp		30	
Extra soya meal	13	20	18
Minerals	2	2	2
At the finish as the result of gradual modification : -			
Barley meal	30	30	40
Tapioca meal	38	37	42
Sharps	20		-
Dried beet pulp		20	
Extra soya meal	10	11	16
Minerals	2	2	2

The costs per cwt. of the above foods were :—

Barley meal ..	11s. 10d.	Beet pulp ..	6s. 3d.
Tapioca meal ..	8s. 6d.	Extra soya meal ..	10s. 1d.
Sharps ..	8s. 5d.	Minerals ..	7s. 5d.

The variations in the proportions of soya meal shown were to eliminate differences in the total protein content of the respective mixtures ; this has already been mentioned. It should be pointed out that the initial 30 per cent. of beet pulp had to be reduced rapidly for two reasons : (1) because it caused the pigs to scour excessively, and (2) because they were unable to cope with the great bulk due to the absorbent

properties of the pulp. Twenty per cent. of this constituent was practically the maximum that could be used, and even then in three meals a day. Tapioca meal was introduced for the sake of cheapness at the end of the fifth week.

Except for the tendency to cause looseness, the beet pulp seemed to have no other deleterious effect on the pigs, which, in general external appearance, were in no way inferior to Lot I, and their "bloom" was good throughout the four months. The animals relished the food and at no phase of the test did they refuse their ration.

Below are given the average quantities and costs of food-stuffs consumed per pig :—

	Lot I				Lot II				Lot III			
	lb.	£	s.	d.	lb.	£	s.	d.	lb.	£	s.	d.
Barley meal ..	271.3	1	7	8	257.5	1	5	5½	355.7	1	16	3
Tapioca meal ..	127.7	0	9	5½	122.7	0	9	3½	132.1	0	10	0
Sharps ..	134.4	0	10	1	—	—	—	—	—	—	—	—
Beet pulp ..	—	—	—	—	136.8	0	7	7½	—	—	—	—
Extrasoya meal ..	65.6	0	5	11	79.3	0	7	1	109.4	0	9	10
Minerals ..	12.7	0	0	10½	12.4	0	0	10	12.4	0	0	10
TOTALS =	611.7	2	14	0	608.7	2	10	3½	609.6	2	16	11

Cost per cwt. meal ..	9s. 10½d.	9s. 3d.	10s. 5½d.
Meal consumed per lb. live-weight increase ..	3.69	3.68	3.58
Cost of food per lb. live-weight increase ..	3.95d.	3.65d.	4.01d.

From this table of costs, it will be noted that the substitution of sharps by beet pulp effected a saving of 7½d. per cwt. of mixed meal, or in other terms an economy of 0.3d. per lb. live-weight gain, which in turn meant that Lot II cost 3s. 8d. per pig less to feed. Lot III was not essential to the comparison of sharps and beet pulp, but the results given by it are included here as a matter of general interest. It will be seen that, as was to be expected in view of the greater concentration of the ration through the omission of the fibrous ingredients, this Lot gave slightly the best results in growth and utilization of food, but, on account of the increased cost of the ration, the financial results were definitely inferior to those obtained from Lots I and II.

The figures overleaf indicate that there was little difference between Lots I and II, the greatest disagreements occurring in the fasted and dead weights and carcass percentages,

SUMMARY OF AVERAGE WEIGHTS			
	Lot I (Sharps)	Lot II (Pulp)	Lot III
	lb.	lb.	lb.
Initial weight ..	53.03 (9 pigs)	53.73 (10 pigs)	54.85 (10 pigs)
Total gain ..	165.85	165.4	170.2
Gain per week ..	10.36	10.34	10.64
Final weight ..	218.88	225.05	219.13
Fasted live weight	222.16 (6 pigs)	217.85 (7 pigs)	221.29 (7 pigs)
Dead weight ..	179	171.43	180.57
Carcass percentage	81.53	78.58	80.21

in which Lot II are slightly inferior. The carcass percentages are calculated from the live weights taken after 24 hours' fasting, that is immediately before killing. At the termination of the experiment, 70 per cent. of the animals out of each lot had reached bacon weight (Midland); the tenth pig of Lot I died some 14 days before at approximately 10 scores live-weight. Rather better rates of growth were recorded by Lot III, but, as already mentioned, these were not compensated for by reduced cost.

Carcass Quality.—With the object of establishing beyond doubt the suitability of feeding dried beet pulp to bacon pigs, from the standpoint of quality in the final product, a sample of back fat was taken from each individual to determine the iodine number. The average for all lots was satisfactory, indicating the fats to be firm; the range of numbers for each lot was as follows:—

Lot I	Lot II	Lot III
55.18-63.10	51.75-59.85	54.34-59.49

The average figure for Lot I was slightly more than that of Lot II, which is possibly explained by the fact that the former's ration contained a higher oil percentage.

A fortnight after the pigs were killed, the sides of bacon were inspected and graded, particular attention being given to the state of the fat, which, in practically all cases, was found to be of good colour, hard, and without greasiness. There were no appreciable differences between the lots in bacon quality, and all sides were of good quality and satisfied the requirements of the curers.

Conclusions.—The results of this trial indicate in a fairly conclusive manner that "plain" dried sugar-beet pulp, when supplemented by a protein food, can be made an efficient substitute for sharps for fattening hogs, but should not form more than a fifth of the ration if looseness is to be avoided. To eliminate the possibility of digestive trouble, and to obtain the best returns, feeding should be carried out thrice daily

where this food is included in the mixture. It should be used with care if given to pigs under 16 weeks of age.

For general information it may be added that, since the termination of this test, beet pulp has been included in the rations of feeding hogs in addition to those of sows, etc., as a matter of routine at the College, and so far no cause for doubt has arisen as to the wisdom of this practice.

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* * * * *

SEED COLOUR IN CRESTED DOGSTAIL

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It had become customary for New Zealand farmers to demand crested dogstail seed* of a bright yellow hue and clean appearance, and to regard dark samples with a certain amount of suspicion. English farmers have also favoured this bright-coloured seed. To test the validity of assessing the value of this seed on its brightness of colour, a series of experiments, here described, was conducted at the Massey Agricultural College during the summers of 1929 and 1930.

As a general rule, laboratory germination of the bright-coloured seed in New Zealand has been satisfactory, so that the utility of this type appeared to be established. Germination tests in England, however, were less favourable. Frequently, samples that showed high germination capacity at the time of export from New Zealand gave indifferent results when tested in England; but darker seed samples, submitted to similar tests, proved more satisfactory. This seemed to indicate that the dark seed stood shipment better than the golden-yellow type. The difference under test between the two samples suggested that the darker seed was more mature and had greater vitality, and this view is confirmed by the tests under notice.

A word of warning is necessary, however, as all dark seed is not of the highest quality. In a system of harvesting, in

* The term "seed" is here used for caryopsis. When colour is referred to in conjunction with the seed, the colour of the flowering glume only is indicated. The contracted upper portion of the glume is often dull straw-coloured, and is not considered in the scheme of colouring.

New Zealand, where a seed crop, as such, is not grown, the ripened seeds are extracted from seed heads that develop and persist in a pasture. Dark seed of high quality may be obtained in this way provided the seed is properly harvested and stored. Further darkening of the seed, however, may occur if the method of drying is at fault, or if the seed is insufficiently dry when stored, or as the result of bad harvest weather; and in each case a deterioration in the vitality of the seed is apparent. Thus, by insisting on bright seed, the farmer has safeguarded himself against purchasing dark seed that may have this defect. Indeed, the objection to dark seed in some districts of New Zealand has been so pronounced that seedsmen have found difficulty in disposing of any but canary-yellow samples. The germination test should be able, however, to segregate, definitely, from supplies of dark seed any lots that have been badly harvested or stored.

At the present time, the New Zealand demand for the bright seed, while still prevalent, is less insistent. *Provided germination is satisfactory*, it is suggested that the extended use in both countries of the darker seed of crested dogstail would lead to better results with this grass.

The Experiment.—Twenty-eight plants, grown from both commercial and locally-collected seed, were chosen. Plants as diverse as possible in growth-form and flowering-date were selected, but only plants that had several heads flowering simultaneously could be used. At flowering-time, each plant was examined and the heads that flowered at approximately the same date only were retained. It was thus possible to retain from 7 to 14 uniform heads on the selected plants.*

When seed-formation had commenced, a head was clipped from each plant at three-day intervals, so that the length of time between the removal of the first and last head of any one plant varied from three to over five weeks, depending on the number of heads selected for examination. To obviate the possibility of after-ripening, the seeds were examined in the laboratory as soon as possible after their removal from the plant. They were examined under a 20-power magnification and separated out into groups according to their colour. To ensure uniformity, they were graded in diffused daylight with a white background. It was found that practically the whole range of colours displayed by the seeds could be con-

* As these plants were set out in rows 18 in. apart and allowed 9 in. between each plant in the rows, they had ample room for development and produced a large number of flowering heads.

veniently divided into 18 colour-groups, and, in order to keep these colour-groups constant throughout the experiment, a chart was painted and used as a standard whenever seed was examined. The following list gives the selected colour-groups. It will be noted that there is a gradual sequence from green through yellow, orange and brown to almost black. The upper halves usually assume a darker colour before the lower halves.

COLOUR GROUPS

- (a) All parts green.
- (b) All parts greenish-yellow.
- (c) All parts greenish-yellow; yellow more pronounced.
- (d) All parts canary-yellow.
- (e) All parts canary-yellow with a trace of orange.
- (f) All parts orange-yellow.
- (g) All parts orange-yellow with a trace of brown.
- (h) Lower two-thirds orange-yellow; upper third light brown.
- (i) Lower half orange-yellow; upper half light brown.
- (j) Lower half orange-yellow; upper half medium brown.
- (k) Lower half deep orange; upper half reddish-brown.
- (l) Both halves a uniform medium brown.
- (m) Both halves a uniform darker brown.
- (n) Both halves a uniform deep reddish-brown.
- (o) Lower quarter deep orange-brown; upper three-quarters almost black.
- (p) Both halves almost black.
- * (x) Both halves uniformly dark straw colour.
- † (y) Both halves uniformly light straw colour.

Results.—The first heads to be collected contained a high proportion of groups (a) and (b). As maturity progressed the green and greenish-yellow gave place to other colours of darker hue. Thus, the longer the seed remained on the head the greater the manifestation of colour became.

Table I shows the mode of colour development in three of the plants.

Plant A8 shows a gradual and regular transition of the seed colour from green through yellow to the darker groups. This is the most regular plant in the series, and the range of colours attained is extensive, as 15 out of the 18 are represented. The transition from green to the first appearance of the dark group (o) takes 15 days.

* The group (x) seeds are usually well developed, but have lost any bright pigment they may have possessed. The bleaching does not take place directly from green, but the seed attains some other colour before this stage is reached.

† The group (y) seeds have failed to develop normally and consist mainly of "husk." On certain plants the percentage of these seeds is very high. It is possible that the cause may be either seasonal or constitutional, or a combination of both these factors.

TABLE I.—COLOUR GROUPS OF SEEDS FROM HEADS COLLECTED AT THREE-DAY INTERVALS

Seed heads in the order of collection	Plant A8										Plant A16										Plant A26										
	Percentages in each colour group										Percentages in each colour group										Percentages in each colour group										
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	11
(a)	51	12									(a)	67									(a)	100	89	20							
(b)	33	38	21	13							(b)	20									(b)	8	16								
(c)	8	12	20	45							(c)										(c)	44	22	49	22						
(d)		12	33	15							(d)	4									(d)	22	47	27	28	13	26	28	9	22	
(e)			19		43	55					(e)	3	10								(e)	6				8	33	13	4	39	
(f)					38						(f)		9								(f)					5					
(g)						22					(g)										(g)										
(h)						12	41	18	13		(h)		4								(h)										
(i)							31	32	18		(i)										(i)										
(j)											(j)										(j)										
(k)											(k)										(k)										
(l)											(l)										(l)										
(m)											(m)										(m)										
(n)											(n)										(n)										
(o)											(o)										(o)										
(p)											(p)										(p)										
(q)											(q)										(q)										
(r)											(r)										(r)										
(s)											(s)										(s)										
(y)	8	26	7	27	19	11	16	19	19	19	(y)	10	58	26	46	32	34	33	85	35	26	3	20	25	24	37	35	20	31	34	56

Colour groups

Plant A16 exhibits a rapid transition through the yellow to the darker groups. The period between the last appearance of green and the development of the colour-group (o) is, in this case, only nine days.

Plant A26, on the other hand, is very slow in developing colour darker than yellow. Although the heads were allowed to ripen on the plant for over three weeks after the first yellow colour appeared, yet (omitting the undeveloped seeds of group (y)) yellow or light brown is the dominant final colour. A period of 24 days elapses between the disappearance of green and the first appearance of the darkest colour (l).

These three examples serve to show the great individuality within the species for the production of colour, although the individual plants are under the same treatment and conditions of weather and growth. In all cases, however, the effect of maturity is to increase the intensity of seed colour.

Seed Weight and Colour.—Not only is colour affected by maturity, but also seed weight and germination. In order to test the relationship between these factors, eight plants were selected, and 200 seeds of each of the main colour groups were weighed and afterwards tested for germination capacity.

Table II shows the increase in weight coincident with increase in colour intensity.

TABLE II.—THE RELATION BETWEEN COLOUR AND WEIGHT

Plant	A7	A4	A26	A8	A21	A22	A13	A9
Colour groups	Weight in milligrammes of 200 seeds							
(a) ..	54.4	50.1	90.2	65.6	67.7	41.2	71.6	—
(b) ..	75.4	71.7	133.9	91.3	—	67.9	92.0	—
(c) ..	91.1	86.6	176.7	109.4	94.0	85.2	97.3	104.5
(d) ..	—	121.6	193.2	121.3	99.6	100.0	123.4	120.4
(e) ..	109.0	141.6	204.3	147.1	108.5	121.8	125.8	134.9
(h) ..	120.8	127.0	198.9	153.8	—	—	158.0	152.4
(j) ..	136.1	—	—	166.3	121.3	129.7	142.8	144.0
(o) ..	132.1	—	—	157.4	—	—	—	—
(p) ..	116.6	—	—	—	135.5	—	—	—

It will readily be seen that as colour deepens so does the increase in weight of seed manifest itself until the maximum weight is reached, after which, in most cases, there is a slight decrease. This final decrease in weight may be due, either directly or indirectly, to loss of moisture by the seed.

The individuality of the plants is again shown in regard

to the weight of the seeds produced. In Plant A26 the seeds were relatively heavy, 200 seeds at the heaviest stage weighing 204.3 mg., while an equal number of seeds from Plant A7 at no stage exceeded 136.1 mg. The seeds of the majority of the plants do not attain their maximum weight until brown has appeared.

Seed Colour and Germination Capacity.—Table III gives the germination figures for seeds of the different colour groups in the eight plants. The final germination count, taken at the end of 18 days, indicates the capacity of the seed to germinate, while the figures for germination, at the end of 8 days, are useful in assessing the vitality and energy of germination of the seeds.

These figures show clearly that the vitality and germination-capacity of the light-coloured seeds is by no means good when compared with the more mature seeds.

In respect to vitality and germination-capacity of the seeds, plants again display a very wide variation. While some plants produce seeds that approach maximum vitality in colour-group (c) (e.g., A4 and A26) seeds from other plants do not reach the maximum until brown is reached (e.g., A7 and A22). After this stage all plants are uniformly good.

Conclusions.—The true value of seed lies in its performance, and the object of this investigation was to determine whether, by adhering to the bright, canary-yellow samples, the best value was being obtained for money expended on the seed ; also whether the best product was being encouraged. It has been shown that the colour of crested dogstail seed becomes darker with maturity, and coincident with this there is a greater vitality and better germination. It has also been shown that in order to obtain a uniformly light-coloured sample, a sacrifice of seed vitality, germination-capacity, and weight has to be made. Under some conditions this sacrifice for colour can be very great. The common New Zealand method of growing crested dogstail along with perennial ryegrass, in order to obtain a double seed crop, is not to the benefit of dogstail. As the seeds of this plant ripen after the ryegrass, it is often cut before the correct stage of maturity is reached, and, as opposed to "stripped" seed in general, a light-coloured sample is often produced. Such immature seed cannot be expected to compete in a seeds mixture where combined with more bulky and more vigorously-growing species. As dogstail is normally slow in attaining a hold in

TABLE III.—THE RELATION BETWEEN COLOUR AND GERMINATION

Plant	A7		A4		A26		A8		A21		A22		A13		A9	
	8 days		18 days		8 days		8 days		8 days		8 days		8 days		8 days	
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
(a)	6.0	9.5	32.0	63.0	70.0	81.5	9.0	45.0	34.0	47.0	—	—	22.5	49.0	—	—
(b)	10.0	11.5	75.5	92.0	89.0	96.5	27.5	57.5	—	—	2.0	11.0	62.5	85.0	—	—
(c)	22.5	68.5	91.5	97.5	98.0	99.0	55.0	80.0	81.0	85.5	17.5	37.0	60.0	86.0	55.5	70.0
(d)	—	—	97.0	99.5	96.5	99.0	73.5	88.0	96.5	97.0	57.5	86.0	87.5	96.0	75.5	88.5
(e)	79.0	98.5	97.5	98.0	94.5	100.0	93.0	95.5	95.5	96.0	86.5	90.0	90.0	97.5	85.5	97.5
(f)	94.0	99.5	93.0	98.0	95.5	97.5	99.5	99.5	—	—	—	—	96.0	99.0	97.0	100.0
(g)	98.0	100.0	—	—	—	—	98.5	99.0	100.0	100.0	88.0	98.0	94.0	99.0	97.0	100.0
(h)	98.5	100.0	—	—	—	—	100.0	100.0	—	—	—	—	—	—	—	—
(p)	97.0	99.5	—	—	—	—	—	—	100.0	100.0	—	—	—	—	—	—

Colour groups
(a) (b) (c) (d) (e) (f) (g) (h) (p)

the pasture, even under the best conditions of growth, it is doubly handicapped when vitality is low on account of immaturity.

The loss due to the shedding of the seeds increases with the length of time they are allowed to mature. Fortunately, this loss of seeds is, to some extent, counterbalanced by the increase in weight and size of the remaining seeds. In the majority of plants tested, the seed vitality was not at its maximum until the appearance of light-brown (colour-group (h) or (k)) which coincides with the maximum weight attained.

Taking all the factors into consideration, it appears advisable to allow maturity to progress until a light-brown seed sample can be obtained at thrashing time, after allowing for after-ripening to take place when in the stook. This will ensure maximum germination-capacity, vitality, and weight, coupled with an attractive appearance, and yet reduce loss from shedding to a minimum.

The immaturity of much of New Zealand's dogstail seed, with the consequent loss in vitality, may be the cause of its inability to withstand shipment overseas. It should be remembered that there is always a safe guide in assessing the value of any seed, and this is its power to germinate both quickly and well.

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A WESTERN COUNTIES FARMER IN 1700

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THE great majority of early writers on farming promised their readers fantastic rewards if their individual projects and ideas were adopted. A thousandfold return might be expected if some special and often mysterious manure were applied, or if some new implement, working directions for which were far from explicit, to say the least of it, were to be used. It is a refreshing change from such suggestions to turn to a work, almost inadvertently produced, which only records the advice and opinions of practical men and the experience of its author. Such a work was not only of use at the time of its publication, but it provides modern readers with a picture of agriculture in the districts where the farmers, whose sayings are noted, lived and had their being.

Edward Lisle settled at Crux Easton in Hampshire about 1693, when he was about 27 years of age and was determined to make farming one of his chief occupations. In pursuance of this design, he made it his business, wherever he went, to become acquainted with the most reputable farmers and to get the best information he could in all the branches of husbandry known and practised by them. He noted such opinions and advice as he thought might be useful to him, and later on added comments based upon his own experience. His first idea was to provide only a commonplace book for his own use, but, about 1713, he had the idea that these notes, which were fairly comprehensive, would be useful to other farmers. He then began an index and made some effort towards writing a suitable introduction; but, although he did not bring this idea to fruition, he continued making notes and observations to the day of his death in 1722.

Although permanently settled at Crux Easton, Lisle had business in Dorset and often went there. His father-in-law, Sir Ambrose Phillips, of Garenton, lived in Leicestershire and this was the reason for Lisle's frequent visits to and notes about that county. He also had estates in Wiltshire and in the Isle of Wight, and their management for a gentleman of his character necessarily involved constant journeys between these places and Crux Easton. Most of these visits seem to have been fruitful in the gathering of farming knowledge; this with what he learned in the course of other journeys is recorded and commented upon. The actual business of farming

and of making these by no means perfunctory records must have occupied a great deal of Lisle's time, but he was also interested in and wrote upon divinity, acted as a Justice of the Peace, and had a family of 20 children, 17 of whom survived him.

It was not, however, until 1756 that this collection of farming advice was given to the world. One of Lisle's sons, Thomas, had shown the manuscript to some farmers he knew, and to some gentlemen who had an interest in agriculture, and they thought the book would be useful to a wider public. Thomas was therefore encouraged to collect the material under its various heads and put it in order for publication as Lisle's *Observations in Husbandry*. In his "Advertisement," from which most of the information given above was obtained, Thomas warns the reader that he "must not expect a compleat body of husbandry in these papers. Some things are but lightly touched upon, as hops and rye, and others not mentioned at all, as hemp, flax, etc., and many useful observations might perhaps be added, even in those matters which are treated on at large, and in which the author was most conversant; for such is the extent and variety of the subject, that, according to his remark in the introduction, it is never to be exhausted. Every day produces new inventions and improvements in agriculture, but perfection is unattainable. . . ."

A further very pertinent warning is contained in the words: "nor is the knowledge of husbandry to be acquired by reading without practice. Books may give valuable hints to those who have judgment to make use of them, but, to learn the first rudiments of this art, it is necessary to serve an apprenticeship to it as to other trades."

The publication of the book was certainly justified since, one hundred years after it appeared, Donaldson, writing on *Agricultural Biography* (1854), was able to say that "it had ever been very deservedly esteemed—his inquiries had been very extensive, and the observations and deductions are acute and very honest. . . . Lisle was a very superior person, and promoted the art of agriculture, though he did not originate anything new, or devise any better mode of executing the old performances. He collected the best ways and put them forth to be imitated." The methods set out in *Observations in Husbandry* may, therefore, be accepted as a description of the high farming of the late seventeenth and early eighteenth century in Hampshire, the Isle of Wight,



Frontispiece of *Observations on Husbandry* 2nd Edition 1771

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Dorset and Wiltshire, in addition to comments upon the farming of other districts.

Praise of country life is almost as old as the written word of man, in spite of the constant flow of population towards cities as food production became more effective in every civilization within historical knowledge; it is not, therefore, surprising to find that Edward Lisle opens his introductory essay with a plea in favour of the preservation of England's rural population. The virtues of the husbandman are admittedly those that make for stability in any race, and although, in 1700, there were only just over five million people in England and Wales, Lisle was as certain that absentee landlords, pretentiousness in the yeomanry, and the tendency of the labourer to go to cities were bad, as if he had been writing at the present day. Estates were even then changing hands with depressing frequency, and the yeomen, who had formed a link in the chain of rural life between the landlord and the labourer, and had worthily filled the minor offices of the parish, had caught the prevailing infection for luxury, which was ruining them financially and bringing them down to the level of the wage-earner. Moreover, in Lisle's opinion, farming was not only a fitting occupation for the landowner and yeoman, and advantageous from the point of view of national welfare, but one which would maintain health and promote longevity. Lisle adds to his other encomiums that, as he had had some taste and relish of these pleasures, he was very desirous to propagate the sense of them as universally as he could, and that it would add very greatly to his satisfaction to have partakers with him in the enjoyment of it.

Although Lisle's son points out that he began his collection of material when he was but young at the business and that, consequently, there may be some rules in it that experienced farmers will have no need of, Lisle was essentially up to date. When he started farming, the turnip crop was cultivated in very few—and those isolated—parts of the country. It was known in Suffolk and in Essex, but had not spread very far into Norfolk, if we may believe that Townshend introduced it to the Rainham estate as the earliest grower in the north of that county. Donaldson, however, points out that turnips were well known to Lisle, and the broadcast raising of the crop of plants is most accurately described in the book. The overcropping of lands after being limed and pared and burnt is also well understood, and is to be avoided.

These are, however, slight generalizations, and the working of farms in the western counties in his day needs a closer description than this.

Lisle's *Observations* open with a discussion of arable land in general and progress, via manures and manuring, ploughing, harrowing and sowing, to the treatment of the different crops until they are harvested. He then proceeds to discuss grazing, the management of grass land and stock, to orchards, gardens, etc., so that the work—although it does not pretend to be a "compleat body of husbandry"—is fairly comprehensive.

The section dealing with manures is mainly occupied with generalities, in which the use of animal and bird excreta figures largely. Town waste is mentioned and we are told that soot was put on the wheat during February in the county of Leicester; therefore Lisle need not fear burning his wheat with it. In Berkshire, near Ilksley, malt dust was harrowed in with the barley, sometimes at the rate of 80 bus. an acre, and was said to be better than dung if well washed-in by rain. A prevision of a modern invention is suggested by the statement that straw, not half dung, carried out into the fields and laid in heaps and turned after rain will become dung in good time.

The more usual manures, in addition to farmyard dung and the fold, were, however, lime, chalk and marl. The last-named was good for all white, sandy or poor light lands; chalk was used to the extent of 25 loads an acre in the Isle of Wight, and a note on its use in Essex is added. Lisle was informed that it was good on pasture and on hop, clover and rye-grass. Lime was widely used in Wiltshire and in Dorset, the former using 24-30 qr. an acre and the latter 20 hogs-head of 4 bus., but in the Isle of Wight a different allowance was made, i.e., a bushel on a lugg square— $16\frac{1}{2}$ ft. \times $16\frac{1}{2}$ ft.

The Wiltshire heavy lands were used for wheat. "The husbandry of wet, cold, strong clay-land in Wiltshire," says Lisle, "is to turn it up as early as one can in the spring for a wheaten fallow; if the ground be so dry and starky, that eight oxen and a horse must be put to the plough, so much the better; on this fallow (that is on this one earth) they sow their wheat and drag it in, and have much better wheaten corn than if they gave their wheaten land three earths." Apropos of which, a farmer named Baily in this county very strongly persuaded Lisle to keep a plough of oxen with his horse plough, because oxen, if used ten to a plough, could summer fallow the strongest lands in dry weather. Lisle was

indeed prejudiced in favour of large plough teams on stiff land or lay or hilly places, estimating that six horses would plough $1\frac{1}{2}$ acres daily while a team of four could only compass one acre. A sidelight on the self-sufficiency of the farmer of that time is supplied by the advice that it is the cheapest way to work up harness in the house. The harness maker was paid 1s. a day and his keep, the farmer finding the material. It was, therefore, necessary to provide bulls' hides two or three years before and put them out to the collar maker for dressing.

The seed sowed varied between $2\frac{1}{2}$ and 4 bus. an acre, the larger quantity being sown in the poorer land. One Berkshire farmer, Hillman, thought that when 3 bus. of good seed were put in, the yield would be 20 bus. an acre and the crop would sell at 12d. above the market, no mean figure in those days. It was, however, useless to do this heavy seeding on the open arable fields, but only on enclosed land. The Crux Easton farmers bought their seed from Newbury because the land there was a white earth, while their own was red. Rotations were not very elastic on account of the general prevalence of open-field farming. Some approved of wheat, peas, barley, but others, like Farmer Wingford, thought wheat, peas, would do on clay. On the Hampshire hills, a fortnight before or after Michaelmas was generally considered the right time to sow, but Lisle thought it better to get the seed in by the quarter day. The later-sown land was more heavily seeded than the early.

Much of the Down land was being broken up for wheat at this time although, after a few years' cropping, it was sometimes allowed to go back to grass. One farmer, Raymond of Puck Shipton, in Wiltshire, broke up grass, sowed first white oats, then "great" wheat and next "red" wheat, "so that the land is tamed." The practice in Leicester was also to sow wheat as the last crop before laying down. Barley was sown at the rate of 4 bus. generally, but on very good ground 5 bus.—this quantity of oats also was sown in the hill country. In the light lands of the Hampshire hills the land was laid flat for wheat, but rounded up a little if clay. Near Holt, in Wiltshire, the wheat was not rolled, but sown 4 in. deep in round furrows, and in that county the farmers prepared to sow broad clover with black or white oats if the land worked up mellow. The wheat, after harvest, was cooked so that it could be left out a month.

Lisle had seen little rye grown in the counties with which

he was most familiar, but some was cultivated in Leicester. He preferred the middle ripe barley to the rath ripe (early) which had been developed at Pewsey and was used in Berkshire and Oxford. Sprat was, however, good for rank land. The white oats also yielded better than the black, which were more subject to blight. Other crops he deals with are buckwheat, beans, peas and vetches. The last-named were sometimes ploughed in for green manure, and he gives us the costs of sowing vetches and broad clover, which show a saving of 9s. 6d. an acre in favour of the latter. Near Calne, in Wiltshire, the clover was ploughed in the second year, rolled, or trodden with sheep and then wheat was sown.

Lisle's acquaintance with turnips has already been mentioned. He advocated liming to keep off the worm, and late sowing to avoid the fly. If the fly appeared, he suggested that tobacco dust spread on the ground would destroy the pest. For hoeing, migratory labour from Newtown, in Wales, was employed in 1707.

The farmers in Wiltshire used their good grazing land for fattening stores. They did not, however, like the Welsh and Shropshire cattle because they did not fatten well. The black cattle from North Wales and the red and brown cattle from Glamorgan, from which the Herefords probably derive, fatted kindly, and it was from these districts that the Wiltshire graziers obtained their stores. Lisle comments that the north country beasts that are of the western parts, i.e., the Lancashire Longhorn, from which it is believed Bakewell bred his improved stock, much exceeded those of the western counties in bulk and weight, because in the north they ploughed with horses while the oxen of Somerset and the Vale of Wilts were worked. A natural result of this comment are the directions for cuing (shoeing) working oxen which follow. Lisle states that a cow calf will make good beef at three years old, but steers not till four or five, and he continues with a great deal of information about dairy management, and butter- and cheese-making.

From his district, many fat lambs had been sent to London in 1704 and the following years, and fat ewes at the same time. There had been no fluke and the flocks had multiplied rapidly, while the spring drought in 1707 had made the farmers think that they would not be able to fatten larger cattle. Hog sheep, he says, should be two years old before service and he estimated that in the warmer hills $3\frac{1}{2}$ tod (1 tod=14 lb.) of hay were required to winter a sheep. At

Cruz Easton, however, five were necessary. Tups were cut at six weeks old in the Isle of Wight and Hampshire. No folding was done in Dorset, but the sheep were put out to grass after Michaelmas, racks being used for providing the necessary extra fodder. The sheep farmers of this county sent their flocks to the vale lands for one month during the winter. Turnips were not in Lisle's opinion good for wethers, although ewes flourished on them. Tills (lentils) also were excellent for ewes, to breed milk for their lambs. In Somerset, the farmers kept no sheep, because it was a "deep" county and they feared the rot.

Hampshire was then famous for its bacon. Lisle deals at some length with pig-keeping and it is obvious that a section of his book necessarily deals with horse-breeding. An interesting sidelight on the woollen trade is given by his analysis of the wool breakers' work in Wiltshire. These people sorted the fleeces that were alike and then broke up the wool. The tail wool was used for lifts for cloth, rugs and blankets. Half the buttock towards the flank was the long worsted thread in serges and druggets. Wool of the back and ribs was finer and made a drugget thread called abb. The wool of the neck, breast and bottom of the belly made the thread in the finest cloth called the warp and so on. The production of wool was, of course, a preoccupation of the Western Counties farmers of the times, and Lisle remarks that wheat gets cheap in September because the pasture and turnip farmers sell in order to obtain cash with which to buy sheep at Weyhill fair.

The book is completed by comments upon the weather which contain notes on some of the early eighteenth-century seasons. It is, of course, impossible in a short note of this sort to give a comprehensive synopsis of a work which is so detailed as Lisle's *Observations*, but perhaps sufficient has been said to show that he has left us a comprehensive description of the methods employed by our ancestors in the farming of certain districts, and to show us from which of these methods our modern ideas have sprung and been developed into the system of our own time.

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POSSIBLE CAREERS IN THE POULTRY INDUSTRY*

PERCY A. FRANCOIS, O.B.E.,

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It is now generally recognized that poultry-keeping is no longer an unimportant sideline of agriculture or a hobby for suburban residents, for it has become a big national industry, the value of its produce being equal to or greater than that of the whole grain crop of the country, or of the potato, fruit, and vegetable crops combined. So greatly has the post-war consumption of eggs increased in this country, that the home production has nearly doubled since 1913, although the imports remain about the same as in that year. The great expansion that has thus taken place has been made possible only by the adoption of new methods, almost revolutionary in character, which have transformed British poultry-keeping into either a highly specialized industry standing alone, or a specialized department of the farm, to which the farmer devotes as much intelligence and business acumen as he gives to any other of his varied enterprises.

Modern poultry husbandry is not merely an art, but a business and an applied science; and, of the three aspects, perhaps the most important, in these strenuous, competitive days, is the business or economic one. Without an innate business sense or, at least, a knowledge of modern business methods, few people can hope to succeed in the poultry industry. In some branches of poultry farming, such as the production and sale of pedigree stock, a knowledge of publicity work, and of the relative values of various advertising media, are almost essential. British breeders of pedigree stock are finding it advantageous, nowadays, to advertise widely not only in this but in other countries. Some also publish catalogues in several foreign languages and travel abroad in countries where business is likely to be obtained. Organizing ability, moreover, is necessary, particularly in the use of labour. Avoidance of wasted effort, the use of labour-saving methods and devices, and, above all, wise and firm control in management, are factors that will have a material influence in producing a satisfactory balance sheet. In short, to be successful, a poultry farm, like any other business, must be organized and managed on sound economic lines.

* This is substantially a reproduction of an address broadcast on March 9, 1932, and here published by permission of the British Broadcasting Corporation.

Organizing and business ability will not, of themselves, achieve success, as many people with insufficient technical knowledge have found to their cost. Poultry are living creatures with nutritive and hygienic requirements varying according to season, climate and physiological activity, and cannot be treated on purely mechanistic lines. To maintain the necessary standard of health and quality in the stock, trained observation and skilful practice are essential. Such qualifications, in addition to business ability, are necessary to win success in poultry-keeping, which, in addition, demands the capacity and energy to endure long hours of more or less daily routine work. On the other hand, a poultry farm offers many attractions. It gives a healthy outdoor life ; and the work, if continuous for seven days a week, and particularly exacting at certain seasons of the year, is relatively light in character and does not call for any great physical strength. It is suitable, therefore, for women as well as men. The rearing and care of poultry can be a very interesting occupation, and it is usually possible to combine with it a little fruit and vegetable growing, and, if desired, to keep a small number of other farm live stock, such as pigs, sheep or cattle. Alternatively, poultry farming can be made an important department on a general farm.

What, then, are the prospects that the industry offers in this country ? The most widely-practised form of poultry husbandry is that of egg production for table purposes. We consume annually in this country over 6,000,000,000 eggs, of which about one-half are imported. It must not be thought, however, that the imported supplies will be easily displaced by increased home production : they have become established in our markets over a period of years ; they represent the best produce of their respective countries ; and they arrive here in a graded and standardized form that so facilitates disposal under modern trade conditions that they can be sold in our wholesale markets on description alone. The chief advantage they possess for the consumer, however, is that they sell normally at prices materially below those ruling for British eggs ; and, although they may be, and often are, inferior in quality to the home product, the question of price is a material factor.

The approximate average prices realized last year in our wholesale markets were, for English standard eggs, 1s. 6½d. per doz., and for Belgian, Dutch and Danish eggs of comparable weight 1s. 2d., 1s. 2d. and 1s. 3d. per doz., respectively. As regards cheaper classes of imported eggs, such as those coming

from Poland and China, the price difference is much greater, the approximate average price last year being about 9d. per doz. for Polish and about 10d. per doz. for Chinese eggs. Of the total imports, these low-priced eggs constitute about 24 per cent.; the better-quality supplies, such as Danish, Dutch and Belgian, amount to about 54 per cent.; and supplies from the Empire represent about 22 per cent.

The recent imposition of a 10 per cent. tariff on imported eggs may possibly help to lessen the price gap between home and imported supplies, but if the competition of the cheaper foreign imports is to be met successfully, our home producers, obviously, must substantially reduce their costs of production and marketing by improving their methods, or, alternatively, the people who consume these cheap eggs must in future pay higher prices for home produce of better quality.

It must be remembered, however, that there has been a steady increase in the demand for British eggs since the War. The consumption per head of our population has risen, and this increase in consumption has been met almost entirely by home produce. The limit of expansion in our egg consumption is probably still some considerable way off, since, per head of population, it is much lower than that of several other countries. Since the War, too, conditions have been favourable for profitable poultry and egg production. Egg and poultry prices have been high compared with those obtainable for most other kinds of farm produce, while the prices of feeding stuffs have been relatively low. It is not to be expected, however, that the high profits realized in the immediate post-War years will be obtainable in the future; but, for the efficient poultry-keeper who understands his business, there appears to be every prospect of deriving a satisfactory livelihood from poultry husbandry.

Those who contemplate taking up poultry-keeping as a commercial enterprise would be well advised to obtain practical experience before investing their money. Such experience can be obtained by not less than a year's training on a successful poultry farm, followed (or preceded, if possible) by a course at an Institute, such as the National Institute of Poultry Husbandry. In many instances, poultry farmers are willing to take pupils without fee in return for their services, but there is a danger, in such cases, that the pupil will spend too much time in mere mechanical routine without gaining a proper insight into the business management of the farm.

As regards the capital required, everything depends upon

the kind of living that the beginner expects to derive from his enterprise and upon his individual capabilities. Some of to-day's most successful poultry farmers started with very little capital, building up their undertakings mainly by hard work and enterprise. Broadly speaking, the capital outlay required to establish an egg-production farm is about 15s. per head of laying stock; but the amount will, naturally, vary with the individual circumstances, e.g., whether the land is purchased or rented. On the figure mentioned, however, it should be possible for a young man or woman with average intelligence, energy and knowledge to build up a successful business, showing as good a return on the capital invested as that obtainable from any other branch of agricultural production or, indeed, from many forms of urban activity.

Besides table-egg production, there are other branches of the poultry industry that deserve consideration. The business of table-poultry production is much smaller in the aggregate than that of egg production, the consumption being valued at approximately £10,000,000 per annum compared with £33,000,000 for eggs. Moreover, we already produce about 70 per cent. of our total requirements. Nevertheless, if greater supplies of British poultry were available and were marketed, in suitable form, at prices below the luxury category, it is probable that a considerable increase in consumption would follow.

The breeding of pure-bred stock, with good egg-laying pedigrees, is another specialized branch of poultry farming that has proved profitable in numerous instances, and, although competition in this field is keen, the really skilled and reliable breeder has little reason to complain about the demand for his produce. The capital required in a business of this sort, however, is relatively large, and several years may elapse before a beginner is able to build up such a trade and reputation as will enable him to make a reasonably good living.

These are the principal branches of poultry husbandry; there are, however, others that need not be detailed here. Generally speaking, the fact that a tariff of 10 per cent. is now imposed upon imported eggs and poultry, while maize and wheat will be imported free of duty, and milling offals may be available in greater quantity under the operation of the Wheat Quota, should be encouraging factors for those engaged in the industry.

The part that education and science now take in the poultry industry is so great that numbers of men and women have

found careers in these directions. Training in poultry husbandry is now part of our public system of education, and practically all our County Councils, agricultural colleges and farm institutes employ qualified instructors, and either possess well-equipped educational plants for the training of students, or carry on various practical demonstrations in poultry farming, or stock improvement schemes. Such work is financed from local rates supplemented by State grants or private endowments, and is mainly conducted under State supervision. County Councils provide itinerant instruction free to all residents in their respective areas. Some councils also possess farm institutes at which are given short courses in poultry work, and scholarships are often available that enable this instruction to be obtained at little cost.

The duties of county poultry instructors, who may be of either sex, are very diverse, and call for particular physical and mental qualities. The work is mostly of a peripatetic character, such as evening lectures in village halls, advisory visits to farms, inspection of approved poultry-breeding centres, attendance at local markets, supervision of county laying-trials, etc. Although it is essential for the instructor to possess a sound knowledge of the many practical, commercial and scientific aspects of modern poultry husbandry, this is not all-sufficing. Almost equally important is a capacity to impart knowledge in an effective manner to people who may be either younger or older than the instructor, and who may be well or indifferently educated. Tact and common sense are required, since advice must be given without offence to those of mature years, and the advice given must be applicable to the particular circumstances. Further, the large amount of travelling involved and the irregular and long hours, unavoidable in itinerant work of this character, demand the possession of a robust physique.

Excellent facilities for obtaining the necessary training for these appointments now exist in this country. A National Institute of Poultry Husbandry, with an educational plant equal, or superior, to that possessed by any similar institution in the world, was established a few years ago in Shropshire. At this Institute, one- and two-year courses of instruction are provided, and students are prepared for the examination for the National Diploma in Poultry Husbandry, possession of which is now generally regarded as a desirable qualification for applicants for instructor's posts. Certain scholarships, available at the National Institute, are provided by county

agricultural education authorities and by the Ministry of Agriculture, and any young man or woman interested should apply to the Ministry for further information on this matter. The total number of poultry instructors employed in England and Wales at the present time is 78, but while the opportunities for employment are not large, several vacancies usually occur each year. Such vacancies are generally advertised in the poultry papers, and the salaries offered range from about £200 to £450 per annum.

In recent years, poultry research work of a more or less fundamental character has been undertaken at several of our universities and research institutions. Here, again, the opportunities for careers are not numerous, but they are open to both men and women workers. The possession of a university degree in science or in veterinary medicine is usually essential to obtain employment of this character. In fact, further specialized training in the particular field of research is generally required, but post-graduate scholarships of various kinds have been awarded in certain instances, and these have been of great assistance in enabling students to extend their training and experience. Particulars of such scholarships may be obtained from the Ministry. It should be remembered, however, that all temperaments are not suited to research work, which calls for patient attention to detail, keen powers of observation, an analytical mind and the ability to work long hours under more or less quiet and secluded conditions. Results may often be slow in developing and may then prove inconclusive : but the fascination of exploration into the unknown, and the flashes of discovery which may sometimes light up his work, are sufficient compensation to the true research worker for the many disappointments and difficulties that he will inevitably meet. At all events, poultry husbandry offers a largely unexplored field to the research worker, and the call for his services is likely to increase as the industry expands.

There are other directions in connexion with the poultry industry that open up avenues for employment ; but, for further information on this subject, those interested may be advised to communicate with the County Poultry Instructor for their County at the offices of the County Council.

RECORDING, GRADING AND SCORING AT LAYING TRIALS

G. C. HESELTINE.

THE original idea behind egg-laying trials was to establish an independent and impartial measure of the productive powers of the hen. In the first place, the trials afford a method of displaying the laying capacity of hens in general, so that the public can see what good hens can do; and, secondly, they afford a means of comparison between various breeds and strains in the hands of different breeders. It was inevitable that the publicity value of such trials should make them primarily a method of comparing the ability of various breeders to produce heavy-laying stock. The competitive element at once became, and remains, paramount.

The danger of allowing this element to run wild was soon apparent. The craze for mere numbers of eggs, without consideration of quality and the stamina of the stock, soon resulted in an ominous decline in size of egg, size of stock, breeding capacity, and stamina. Promoters of laying trials at once realized the danger to the industry, and, in due course, the trials were revised to make them more useful to the public as a means of comparing the general value of various breeders' strains, in accordance with the policy since pursued by the Laying Trials Committee of the National Poultry Council.

From the breeders' point of view, laying trials are now chiefly valuable for publicity purposes. With one more or less experimental exception, they are tests of laying stock only. They are in no sense a test of the breeding qualities of the stock, although where accurate and detailed information is recorded and made accessible to the competitor, as at the County Trials, a useful guide to suitability for breeding is given. It is true that breeders who can win regularly in successive and divers tests show themselves to be capable of breeding good stock consistently, and they gain a reputation as good breeders. Each individual trial, however, that begins and ends in the space of a disconnected annual period, does not show this. The difficulties attendant upon any undertaking in the nature of a breeding-stock trial place such a venture in an entirely different category, outside the scope of the present discussion. Not only does consistent success in laying trials rightly suggest that the competitor is a capable breeder, but it gives some indication of his stock-sense, the power of selection and preparation which plays a very important part, not fully appreciated, in success at laying trials. Such a breeder would naturally, for

his own economic advantage on his farm, exercise his powers of selection upon his own stock, the standard of which should be appreciably raised by his so doing. Hence, whereas the actual annual laying trial tests the powers of the stock, successive entries at such trials test the breeder.

It is generally agreed that, for the purposes of comparison and record, a measure of uniformity at trials is desirable, and the Laying Trials Committee of the National Poultry Council has held conferences at which a large measure of agreement has been reached. Nevertheless, a certain diversity is not without its advantages. It enables stock to be tested under different conditions of locality, management, etc., and gives breeders a voice in the matter. They can express their approval or disapproval of methods adopted by the measure of support they accord to various trials. While recognizing the advantageous position the leading trials now enjoy, it must not be forgotten that the trials are run primarily for the benefit of breeders, whose support and approval is essential. If it is urged that trials should be for the benefit of the industry as a whole, it must be observed that the trials exert their greatest influence on the industry through the breeders who compete, although the general educational value, through the publication of detailed reports, particulars of feeding, housing and management, etc., is of considerable importance.

To clarify future discussions on this subject the writer would suggest that a definition of terms will be useful. Such expressions as "recording," "grading," and "scoring" are used more or less indiscriminately, with resultant confusion. It is proposed to offer a separate definition of these terms and discuss them separately. They will, therefore, be used to describe three distinct processes.

Recording.—This term might well be confined to the system of house sheets, record books, and reports that forms the *written record* of whatever scheme of grading or scoring is adopted.

Recording properly begins with the method of housing in use at the trials. On this depends whether certain eggs, such as those dropped in the litter or in the yard or run, are to be recorded for the purpose of scoring to the competitor or not. Clearly, when two or more entries are housed together, such eggs must remain unrecorded. The attempt to make a distinction by housing a tinted-egg breed with a white-egg breed is unsatisfactory except where the difference is *exceptionally* marked. The partial tinting of some white egg breeds and the loss of tint

in heavy layers, in such breeds as White Wyandottes, would make the mixing of such breeds as Leghorns, Bresse, or Anconas with Wyandottes, Sussex, Orpingtons, Rocks and even Rhode Islands unsafe from the point of view of accuracy. In this connexion, it is noteworthy that eggs dropped irregularly are those most likely to vary from the normal for the pullet, in both shell quality and tint. Breeds such as Barnevelders or Langshans may be mixed with Light Breeds (except the mis-named "Light" Breed, Welsummer) and the dropped eggs allotted safely, but even then there is the problem of controlling feeding for such diverse breeds. On the whole the practice is very unsatisfactory and, where several entries are run together, dropped eggs should not be recorded to individual competitors.

The single pen system, in which each bird is separately housed, is the most satisfactory for recording, since every egg laid can be credited with certainty to the individual bird. The limitations of capital cost and space, however, make this method of housing unpopular with promoters of laying trials, especially where the entries run into thousands. The system is in operation in South Africa, Australia and New Zealand, and has been introduced recently at two laying trials in this country.

Normally, houses of the cabin, three-quarter span, or long large-flock type are used with trap-nests. The most satisfactory of these forms of housing is that in which each pen is in a separate house or separate section of a house with its own yard or run. In other forms, the eggs laid outside the trap-nests cannot be recorded to the competitor's credit. In order to reduce untrapped eggs to a minimum, it is advisable to provide at least one trap-nest for every two birds in small houses, or two trap-nests for every five birds in large flocks. In either case the trapped birds should be released at least once an hour up to noon (sun-time) and once every hour-and-a-half in the afternoon. Where pens are separately housed, it is permissible to record untrapped eggs to individual hens *where there is no doubt*, e.g., when all the other birds in the pen have already been credited with an egg for the day, but such recording of untrapped eggs should not be done by the trapper, but by a responsible manager or overseer. A safe rule would be not to record untrapped eggs to individual birds, but this would be misleading to the breeder when one pullet persistently laid outside the traps, since it would result in her being given a false record.

The common and necessary practice is to mark the egg with

the number of the hen as soon as it is trapped. The fact that the egg is laid should then be marked up on a pen-sheet where these are used. In some trials pen sheets are not used, but the eggs are collected at the end of the day, graded, and recorded in a register in one operation. Where house- or pen-sheets are used, they may contain a carbon sheet to provide a duplicate record; the original may be kept by the trial authorities and filed as the sole record, while the carbon copy is sent to the competitor at the end of each month. The objections to this method are that *grading* must be done at the time the eggs are recorded, and the carbon sheets get badly mismarked by pressure of the recorder's hand. At some trials a fair copy is made of the pen record sheet and sent to the competitor each month.

The most complete system of recording is that in which the egg is simply marked on a house-sheet when the pullet is trapped. At the end of the day the eggs are collected, graded, and entered according to grade in a record book. At the end of the month the house-sheets are checked by the record book in determining the total number of eggs laid by each pullet. The grade record may then be copied on the house-sheet for transmission to the competitor. The record book is almost identical with the house-sheet, except that it shows grade day by day and provides for totals for each month. It is thus possible to find errors if the house-sheets and the record books disagree, and it may be possible to correct these.

It is advisable to record, as far as possible, all eggs laid. Soft-shelled eggs, shell-less, yolk-less and badly mis-shapen eggs, should be *recorded*, but on no account *scored*. The recording of these non-scoring eggs may be of considerable assistance in locating weaknesses, irregularity in feeding, and so on.

For recording purposes, no two birds should carry the same leg-band, or wing-band, number at any one trial, even in different sections or breeds. It is useful to have also a system of coloured rings for identifying birds in the yard or pen.

Grading.—Only eggs fit to market should be graded for scoring purposes. All other eggs are wastage, and on no account should credit be given for them. Grading allots a measure of credit according to the grades achieved. A fair measure of agreement on grade standards has been reached between various trial authorities in this country, and a first-grade egg is 2 oz. with an allowance of $\frac{1}{8}$ oz. less for the first month of the trials and $\frac{1}{16}$ oz. for the second month. When it is considered that $\frac{1}{16}$ oz. is only 3.125 per cent. of the standard weight of the

egg, it becomes doubtful whether this allowance has much more than a theoretical value. The normal rate of size increase in pullets' eggs, from the first egg to their normal weight, is certainly more than 3 per cent. per month and probably more than 3 per cent. per egg in the vast majority of cases. Hence the allowance bears little relation to the purpose for which it is intended, namely, to allow for the natural increase to normal size from the first egg. The necessity for this allowance, which is in fact more a sentimental concession than a logically-estimated step in grading, is completely lost when birds already in lay are sent to the trials. At a moderate estimate 25 per cent. of the birds are in lay on arrival at the trials.

The commonly accepted and agreed grades for eggs are, 1st, 2nd, and 3rd or "underweight" grades; being normally 2 oz. for 1st grade, and $\frac{1}{4}$ oz. less for 2nd grade. There is a tendency for more trials to adopt also a "special" grade at $\frac{1}{4}$ oz. above the first grade—the County Trials' special grade of $\frac{1}{8}$ oz. above 1st grade is preferable. This has the advantage that it gives publicity to the pens that lay the largest eggs, and possibly contributes to raising the egg-size all round, though this is a debatable point not yet adequately supported by statistical evidence. Serious objection has been urged against the adoption of special grades, on the ground that it tends to encourage the production of abnormally large eggs by *pullets*. It is a well-recognized fact amongst breeders that very large eggs do not give the best hatching results. Since the hens of most breeders lay larger eggs than the pullets, there is a danger that by encouraging the production of special-grade eggs by pullets there will be an increase of very large eggs of low hatchability from the breeding-stock hens.

On the economic side, also, it is questionable whether the encouragement of the production of special-grade eggs by pullets is profitable, except as a counteraction to the tendency towards small eggs. Exact statistics over sufficiently large numbers are not available, but it may be asserted safely that 2 $\frac{1}{4}$ -oz. eggs do not fetch 12 $\frac{1}{2}$ per cent. more than 2-oz. eggs, and therefore weight for weight they are worth less. The cost, in selective breeding, extra food, possible diminution in numbers, and decreased hatchability in second-season stock may well exceed any extra gain in price. The well-known difficulty of preserving good shell-quality in rapid layers is increased with the size of egg, though not necessarily in direct proportion.

A 2-oz. egg is recognized as a sound and obtainable ideal, satisfactory to the consumer and normal for all reasonably

well-bred laying stock. It is dangerous to the industry for laying trials to encourage deviation from the normal. If, however, a 2-oz. standard is to be maintained, some advance on that must be aimed at to counteract the lag towards deterioration in size.

Grading for quality of egg, apart from size, presents so many practical difficulties that it is by common consent omitted at laying trials. The only practicable rule that can be suggested is that only marketable eggs, so far as shell is concerned, should be graded for scoring purposes.

Scoring.—The term "scoring" may be confined to the system upon which awards of certificates and prizes are made. It is therefore a domestic matter concerning the management of the trials themselves. There is no need to seek uniformity in scoring for purposes of comparison, since all necessary comparison can be made on the basis of grading, which should therefore, if possible, be uniform at all trials.

Some measure of variation in scoring at respective trials is not only unobjectionable but even advantageous, since it allows breeders, by the measure of their support of various systems of scoring, to express their individual preferences. Uniformity in scoring, added to uniformity in grading, would, in fact, be very misleading to the public, since it would suggest the possibility of strictly accurate comparison between the results at various tests, and that such comparison has value. Actually this is not the case. To make the results of various laying tests reasonably comparable would necessitate uniformity in feeding, housing, management, and climatic conditions, and such uniformity is manifestly impossible. It is, therefore, better to accept the measure of comparison afforded by uniformity in grading, acknowledging the divergence of the other factors, than to assume a close comparison afforded by uniform scoring which would not, in fact, exist. This is not to say that very useful comparisons may not be made, of considerable educational value, such as those afforded between the County Trials, run on fairly uniform lines, especially in comparing the accumulated statistics of various years.

At most trials, scoring is conducted on a basis of first-grade eggs, allowing a limited number of second-grade eggs. This allowance is actually redundant where allowance for the initial small eggs laid by a pullet has been made by reducing the standard of first-grade eggs for the first two periods of the trials. To score a limited number of second-grade eggs in addition is to make this allowance twice.

The simplest system, commendable because it is easily

understood by the public, which buys on the strength of the reports of the trials, scores by numbers of first-grade eggs, and some trials also score a limited number of second-grade eggs.

It is objected to this system that the ultimate value of the hen, and therefore of any breeder's stock, is the market value of its produce, and this system takes no account of market value, which varies according to the season in which the eggs are laid. Thus, a breeder whose birds lay most of their eggs in the winter or late summer, when eggs are dear, is given no extra credit over a breeder whose birds' output is the same but at its highest in the spring and early summer when eggs are of low market value.

In practice, this objection is not so strong as it appears at first sight, since the winning pens, in the keen competition at modern trials, must lay consistently all the year round to maintain their position. Nevertheless, there may be a considerable difference in the market value of the eggs produced by two pens averaging 240 eggs per bird for the period of the trials. (At very few trials do the leading pens average over 220 eggs per bird.)

To meet the difficulty, two chief systems may be used. The first of these scores on the market value of the eggs produced. Only rarely is this market value the actual price of the eggs sold on the open market. The practical difficulties of such a method are obvious. In practice, first-grade eggs are scored at the current market price for first-grade eggs, and second-grade eggs are scored in the same manner, or at an estimated or arbitrarily-reduced value, as for example 25 per cent. below the price of first-grade eggs. The most undesirable feature of this method is that it allows birds that lay a very large number of eggs, mostly second-grade, to score level with birds that lay a satisfactory and economically profitable number of eggs that are all first grade. This second class of stock is clearly very much more valuable to the industry than the first.

To obviate this objection, some trials score by "points," crediting proportionate points for first, second and/or other grade eggs, variable according to the season. The County Laying Trials, promoted by the various local authorities under the aegis of the Ministry of Agriculture, have a uniform system of scoring by points which is scientifically determined on the basis of the average market value of the various grades over a number of preceding years. This is the most scientifically accurate and equitable method of scoring in use. Nevertheless it is open to the objection that being based on an average over preceding

years, it can never be, except by sheer coincidence, accurate for the actual year of the trials. The system is the only one which by its very nature is bound to be slightly inaccurate, yet its inaccuracy is probably less than that of any of the systems in which value is actually scored.

As a contrast to this, there is the rigid system in use in North America, under which a first-grade egg scores one point and eggs averaging over 24 oz. to the dozen are credited with an extra tenth of a point for each additional ounce, and a corresponding deduction for those below the 24-oz. standard. Under this system, no extra credit is given for eggs averaging over 26 oz. to the dozen, whilst in certain instances, where credit and deduction are made at half this rate, eggs as low as 18 oz. to the dozen may score (0.70 points per egg). The fact that the leading pens in the North American (including Canadian) trials almost invariably score *fewer points than eggs laid* seems to indicate that the system encourages a quantity rather than a quality standard of production, an incipient danger to the industry.

Whatever the system of scoring on which the award of prizes is based, it is usual to show actual numbers and grades of eggs laid. There is no doubt that this part of the report is most read by the public, and though various trial authorities endeavour, by confining their awards to merit arrived at by points, to give the breeder of the best birds the best opportunity of publicity, they are defeated in this by the fact that breeders whose entries have laid the most first-grade eggs, or the most eggs, have the best *advertisement*, because the public more readily understands their claim.

Inseparable from any system of scoring, of course, is the system of housing and the competitive constitution of the entries. Where two or more entries are housed together, no untrapped eggs can justly be scored. Similarly, where a reserve bird is housed with the competing pen, no untrapped eggs should be scored.

Reserve Birds.—The question of reserve birds at laying trials has been very keenly discussed. The sole object of admitting reserve birds is to avoid handicapping an entrant who may lose a bird by accident or disease for which he is not, and cannot be, responsible. In practice, as soon as a reserve bird is admitted, it is an asset for the breeder who loses a bird from some cause for which he may be directly responsible, that is death from disease carried but not developed until the trials have commenced, inherent weakness, or constitutional incapacity to stand the strain of long laying sequences.

A very serious objection to the employment of reserve birds, often overlooked, lies in the fact that it frequently operates against the very man it is used to benefit. A competitor in a winning position may, by losing a good bird near the end of the test through no fault of his own, lose the score of that bird and have to reckon the score of a much poorer reserve bird that takes its place. He would thus lose his position, whereas, in the absence of reserve birds, he would have retained the score of the dead bird and so retained the position he had earned.

Nevertheless, it is still considered desirable by most trials authorities to admit a reserve or reserves to allow for the "hard case," the misfortune or bad luck of losing a bird through no fault of the competitor.

The most common system under which reserve birds are allowed is that in which the "reserve," marked as such before commencement of the test, takes the place of a dead bird, the whole score of the latter being eliminated and the score of the reserve bird being admitted. The grave, and almost insuperable, objection to this system is that, whilst it *sometimes* removes the handicap on the competitor who has lost a bird, it may inflict a serious hardship on competitors who have not lost a bird. The loss of a moderate layer towards the end of the trials and its replacement by a reserve with a higher score may raise the competitor to a winning position, and there have been numerous instances of this. Whilst, in certain circumstances, it may be hard on A to be penalized for the loss of his own bird, it is clearly unjust to penalize B, C, and D, who would normally have beaten A, and have all their birds fit and well throughout the test, because A lost a bird. In the extreme instance of trials that contain only four birds to the pen, and allow as many as two to be replaced for death and other specified reasons, within three months after the trials have commenced, it would appear to be putting a premium on poor stock.

Generally speaking, the breeder who sends a team of birds each of which lives through the trials shows that he has sounder stock than the breeders who lose birds. The mortality returns of all the leading trials show that by far the greater number of deaths are due to weakness in stock. The deaths from peritonitis, liver, kidney, heart, and ovarian disorders account for most of the totals, and where conditions at the trials are equal for all birds, these losses cannot be blamed on anyone but the competitor—they are due to the stock themselves. The deaths that can be definitely regarded as an unjust handicap on the competitor are very rare, perhaps 2 or 3 per cent., and they

would not appear to justify the admission of reserves that must penalize at least some of those whose birds survive the trials.

To answer this objection to the reserve bird system, an arrangement has been devised whereby the competitor enters more birds than actually score, the method being to allow the best three out of four, six out of seven, six out of eight, or ten out of twelve to count for scoring purposes in each period.

Thus at the end of each period the records of the best six out of seven pullets only would be considered for scoring purposes. At the end of the year, either the scores for each period would be totalled for arriving at final positions, or the best six out of seven over the period would be counted to date at the end of each period, including the final period.

Such a scheme has several serious drawbacks. One is that no unrecorded eggs can be credited to the pen for scoring purposes, and therefore the separate housing of pens, for many reasons so desirable, loses its advantage for scoring purposes. A further drawback is that since the birds that score may vary in each pen in each period, it is difficult to watch the progress of the *pen*. In fact, at no time does the egg record or score represent the performance of a definite group of birds. It never represents the performance of six birds because it has taken seven birds to make it, and it is not the performance of seven birds because only six count. Scores and averages on this basis would be purely fictitious, and since they would be numerically high they would be very misleading to the public.

A less theoretical and more seriously practical objection is that under this system of scoring it is easy for an inferior pen to receive an award over a better pen. A competitor entering six good birds all approximately equal in performance might be beaten by a pen of very mixed quality with, say, two high-scoring birds, two moderate and two bad. The first competitor, despite uniformly good quality and a seven-bird total far above the second competitor, would be beaten by the best six of an irregular lot, containing only two good birds. The following example is taken from an actual test performance, and shows the worst pen winning :—

A	B	
220	278	
238	240	A. 7-1711
235	148	best 6-1491
259	311	
242	194	B. 7-1660
271	271	best 6-1512
246	218	
<u>1,711</u>	<u>1,660</u>	

In this case A gets no credit for a bird laying 220 first-grade eggs, whilst B is not penalized for having a bird as low as 148. No fewer than three of B's birds are worse than A's worst bird, whereas only two of B's birds exceed the best of A's. B wins on the six out of seven basis by the doubtful merit of having one very low bird and one exceptionally high bird—a type known to be of doubtful value because of its exceptional figure.

It should be observed that, in these examples, neither competitor needs the system to compensate him for *bad luck*. This applies to most entries, namely, those that do not lose a bird. The system also compensates those who do not deserve to be compensated, namely, those who lose a bird through causes generally attributable to bad breeding and rearing and consequent constitutional lack of stamina. This would undoubtedly *tend* to encourage the entry of birds of lower standard of stamina.

If competitors know that there is no compensation for the loss of a bird, they exercise much greater care in selecting the birds with the best stamina.

Where the system of scoring the best x out of y birds is in use, a pen in which every bird is a good layer *must lose credit* for one of them, though it may be, for example, a N.P.C. copper-ring bird. If, as might be suggested, a special prize were allotted to such a pen or to the best pen counting all birds, the object of the system would be defeated.

Other systems of protecting the competitor against misfortune allow the replacement of one or more non-layers or dead birds within two or three months of the commencement of the trials. It is clear that such procedure, though it compensates a few competitors for presumed misfortune, must also "compensate" some for incompetence and penalise the majority who have suffered no loss.

A sounder attitude towards this problem would be to allow the minority to suffer their misfortune rather than risk penalizing the majority. Such a method has the merit of erring on the strict side, and undoubtedly makes for greater care in selecting entries to ensure the highest standard of stamina. Any attempts to compensate for misfortune have the serious defects of all efforts to legislate for hard-luck cases. They are negative in effect and put expediency before principle, and in consequence they cannot be considered of permanent value to the industry. No laying trials of repute would be moved by any other considerations.

CERTIFIED STOCKS OF STRAWBERRIES AND BLACK CURRANTS

THE possibility of increased plantings of strawberries and other soft fruits, consequent on the imposition of duties on imported fruit and the growing demands of the canning industry, makes it desirable that emphasis should again be laid on the necessity for planting only stocks that are healthy and vigorous and true to type. It is specially important that crops grown for canning shall not be of mixed varieties. It will be remembered that, during the post-war expansion of the area under strawberries, the planting of inferior stocks was often responsible for the impoverishment of the varieties and for unsatisfactory crops. Whatever may be the standard of cultivation, inferior stocks will not yield satisfactory returns; the planting of low-grade material is therefore false economy.

Facilities for obtaining reliable stocks are provided by the Ministry, which issues each year registers of growers whose stocks of strawberry plants and black currant bushes have been examined during the growing season and found to be true to name and reasonably vigorous and healthy at the time of inspection. Certificates issued in respect of these stocks do not imply freedom from disease, but no stock is certified which is obviously unhealthy or lacking in vigour at the time of the Inspector's visit.

Arrangements are now being made for inspections during the coming season, and growers who wish their stocks to be included in the registers should write to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1, for forms of application and explanatory memoranda. It should be remembered that applications for inspection must reach the Ministry *not later than May 31, 1932.*

Details of the operation of the two schemes during 1931 are given in the following notes:—

Strawberry Plants.—Applications were received from 111 growers for the inspection of 217·5 acres of plants. This area was much smaller than that of 1930 when the number of applications was 141 and the acreage 395. The decrease was directly attributable to the poor prices and the limited demand for runners of the previous year. As in previous years, more than half of the applications came from growers in the Wisbech area of the Isle of Ely, Lincs, and Norfolk, and the remainder from various parts of the southern counties. The

stocks of growers who were granted certificates in 1930 were inspected once only in 1931, at as late a date as possible (in late July or early August), but other growers received, in addition, a preliminary visit in June.

The number of stocks and the acreage of each variety inspected during the past three seasons were as follows :—

Variety	1929		1930		1931	
	No. of stocks	Acreage	No. of stocks	Acreage	No. of stocks	Acreage
Bedford Champion ..	18	11.6	45	38.9	20	8.5
Jucunda	8	2.2	14	5.7	4	4.4
Leader	15	4.9	13	5.3	9	2.2
Madame Kooi ..	12	6.3	21	12.3	10	3.7
Madame Lefebvre ..	15	9.8	42	31.7	13	5.4
Oberschlesien ..	8	4.3	31	30.1	57	63.5
Royal Sovereign ..	57	92.9	94	144.3	66	58.0
Sir Joseph Paxton ..	36	48.8	49	68.7	48	45.3
Stirling Castle ..	5	0.7	5	8.7	3	5.1
Tardive de Leopold ..	—	—	16	31.1	20	14.6
The Duke	12	7.2	10	6.4	8	3.4
The Laxton	13	8.9	17	11.8	10	3.4
	199	197.6	357	395.0	268	217.5

The outstanding feature of this table is the increase in the acreage of Oberschlesien which claimed a larger area than any other variety, even surpassing Royal Sovereign, which, in all previous years, had held the premier position and accounted for from 35 to 50 per cent. of the total acreage. These two varieties represented more than half of the area inspected.

Of the total area of 217.5 acres entered for inspection, 185.3 acres qualified for certificates. The acreage certified represents 85 per cent. of the total area and compares unfavourably with 93 per cent. in 1930 and 89 per cent. in 1929. Continuous wet weather was responsible for the condition of many of the stocks which could not be certified. Certain fields which had been entered for certification had to be withdrawn because they were waterlogged at the time of inspection, whilst the difficulty experienced in keeping strawberry beds cultivated and free from weeds had adversely affected the vigour of plants in several other plots. An analysis of the results of the inspection is given in the Table at the top of the next page.

Variety	Certified		Not Certified				
	No. of stocks	Acreage	No. of stocks	Acreage			
				Rogues exceeding 1 per cent.	Lack of vigour	Withdrawn	Total
Bedford Champion	18	7.4	2	—	1.1	—	1.1
Jucunda ..	4	4.4	—	—	—	—	—
Leader ..	6	1.3	3	0.1	0.8	—	0.9
Madame Kooi ..	8	3.5	2	—	0.2	—	0.2
Madame Lefebvre	13	5.4	—	—	—	—	—
Oberschlesien ..	44	52.6	13	7.2	3.2	0.5	10.9
Royal Sovereign	54	51.3	12	0.1	4.6	2.0	6.7
Sir Joseph Paxton	39	39.7	9	—	3.9	1.7	5.6
Stirling Castle ..	2	3.1	1	—	—	2.0	2.0
Tardive de Leopold ..	17	12.3	3	1.0	1.3	—	2.3
The Duke ..	7	3.1	1	0.3	—	—	0.3
The Laxton ..	6	1.2	4	—	1.9	0.3	2.2
	218	185.3	50	8.7	17.0	6.5	32.2

It is gratifying to note the high standard of purity of the stocks. The acreage rejected because of rogues did not amount to more than 4 per cent. of the area examined, while all the stocks of seven varieties were 99 to 100 per cent. pure.

Black Currant Bushes.—Applications were received from 20 growers for the inspection of nearly 404,000 bushes; in 1930 there were 22 applications in respect of about 400,000 bushes. The largest number of bushes entered by any grower was 69,475 whilst the average of 20,200 bushes per applicant was about 2,000 higher than in 1930. Before the time of inspection, a stock of 25,000 bushes, which had been entered for examination, was grubbed up, and the number of bushes actually inspected was 378,802 as compared with 397,170 bushes in 1930.

The table overleaf (p. 150) shows the numbers of bushes of each type inspected and certified, with comparative figures for the previous two seasons.

It will be seen that the French Black group, though reduced in size, again accounted for the largest number of bushes; Boskoop Giant maintained its position and numbers; but Edina and Baldwin declined still further. On the other hand the unclassified varieties showed an increase of 55 per cent. over 1930 and claimed no less than 27 per cent. of the total number of bushes inspected.

Group	1929		1930		1931	
	In-spected	Certi-fied	In-spected	Certi-fied	In-spected	Certi-fied
French Black ..	159,500	140,000	169,111	122,361	119,247	106,647
Boskoop Giant ..	58,600	55,450	53,564	43,214	58,166	51,416
Edina ..	54,240	51,240	30,385	20,635	25,692	25,342
Baldwin ..	158,520	133,470	78,023	75,873	72,999	65,299
Unclassified varieties ..	114,800	102,400	66,087	61,087	102,698	101,148
Total ..	545,660	482,560	397,170	323,170	378,802	349,852

In spite of a decrease of 18,368 in the total number of bushes inspected, the number of bushes which qualified for certification increased by 26,682. Certificates were granted for over 92 per cent. of the bushes inspected. This is the highest standard yet reached, comparing favourably with 81 per cent. in 1930, 88 per cent. in 1929 and 84 per cent. in 1928. It is also interesting to note that, of the 28,950 bushes rejected, 8,850 were submitted by new entrants to the scheme—growers whose total entry was 8,900 bushes. Thus the percentage of rejections for growers with previous experience of the scheme was 5 per cent. against 99 per cent. for the new entrants—a striking tribute to the educational value of the scheme. Of the stocks which Inspectors were unable to certify, 3,000 bushes were rejected on account of Reversion, 16,250 because rogues were present to the extent of more than 1 per cent. and 9,700 owing to the presence of a number of weak plants or to a general lack of vigour.

In the report on the operation of the scheme during 1930, reference was made to the evidence afforded of the popularity of some of the varieties of recent introduction, *e.g.*, Mite Free, Westwick Choice, Blacksmith, Davison's Eight, Invincible Giant Prolific, September Black and Tinker. The numbers of bushes of these varieties certified in 1931 indicate that the newer varieties have become yet more firmly established in commercial practice. They now represent 37 per cent. of the certified stocks and are responsible for the considerable increase in the group of unclassified varieties.

MARKETING NOTES

National Mark Beef.—The weekly average numbers of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during February and March, 1931, February and March, 1932, and the three weeks ended April 16, 1932, were as follows :—

LONDON AREA

<i>Period</i>	<i>London</i>	<i>Birkenhead</i>	<i>Scotland*</i>	<i>Total London supplies</i>
February, 1931 ..	1,918	342	2,352	4,612
February, 1932 ..	1,971	672	1,432	4,075
March, 1931 ..	2,134	187	2,614	4,935
March, 1932 ..	1,764	340	1,335	3,439
Three weeks ended				
April 16, 1932 ..	1,814	241	1,356	3,411

* Figures include Scotch sides graded and marked in London.

BIRMINGHAM AND YORKSHIRE AREAS

<i>Period</i>	<i>Birmingham</i>	<i>Leeds</i>	<i>Bradford</i>	<i>Halifax</i>
February, 1931 ..	506	710	437	112
February, 1932 ..	952	507	505	142
March, 1931 ..	483	776	514	122
March, 1932 ..	885	439	367	97
Three weeks ended				
April 16, 1932 ..	848	422	379	91

The Scheme continues to work very smoothly at Smithfield. Most of the home-killed beef on offer comes from Islington or Birkenhead, and is offered for grading almost as a matter of routine. Although grading and marking are usually completed before the market opens, it is noticeable that whenever, as occasionally happens, sides come up from country butchers during the course of the market, salesmen apply to have these sides graded and marked on arrival. The reason given for the application is generally that if the beef is not graded buyers will conclude either that the beef is ungradable or that it is from imported cattle, with a consequent reduction in its sale value.

The demand for small joints has, if anything, increased during the past year. The possibility of expanding the trade in National Mark beef in the London-area depends largely on adequate supplies of light and medium-weight animals being available. Although the spring trade in beef was slow, well-supplied light weights met with a ready sale.

Supplies of Scotch National Mark beef have shown no marked change. There is still a quantity of Scotch beef coming on to the market unmarked or bearing private marks. The quality of the latter is noticeably variable. While some

Scottish senders have maintained a high standard of quality, others have forwarded some very inferior beef which would certainly not have attained to National Mark standards.

The increase in the number of sides graded and marked, in the latter months of 1931, in the Birmingham area has been maintained since Christmas. Buyers on the wholesale market, however, still have to send their beef to the Ministry's stall for grading. The only exception has been in the case of one wholesaler who has had one or two consignments of cattle direct from the feeder for sale on the grade and dead-weight basis.

In consequence of the increased number of sides now graded at Birmingham, a large number of retailers are anxious for grading on the wholesalers' stalls to be resumed so that they may be relieved of the unnecessary trouble and additional expense of double portage. Negotiations have, however, so far failed to move the Birmingham wholesalers to alter their decision.

Grading in the Yorkshire area has been proceeding satisfactorily during the past two months. A critic of the Scheme, in a recent letter to the Press, maintains that the increased figures in the area are due to more cow carcasses being graded than was the case at an earlier stage. It is true that a number of young cow carcasses are now offered for grading, but few of them can be put in a higher class than "Good." These carcasses are not always marked, as traders in many cases prefer sides which can only be graded "Good" to be left unmarked. There is, therefore, no substance in the contention. The small increase in the number of sides graded and marked has been mainly in "Select" and "Prime" beef.

National Mark Tomatoes and Cucumbers.—Returns received from authorized packers indicate that there was a substantial increase in the quantity of National Mark tomatoes sold in 1931 as compared with 1930, last year's output of tomatoes marketed under National Mark labels totalling some five million lb.

As the result of the progress made, glasshouse growers everywhere are displaying interest in the Scheme, and this interest has been stimulated by the speeches made at the conference of growers, including National Mark packers, held at Cheshunt in February last. A number of applications for enrolment have been received and there are indications that the output under the National Mark will show a further increase in 1932.

Growers who have achieved a measure of goodwill for their own trade-marks have welcomed the new design of National Mark label, which has a much larger space for the insertion of the grower's own name or mark.

National Mark Cider.—The following additional applicants have been authorized under the Scheme :—

H. O. Whiting, Athelney, Bridgwater, Somerset.
W. J. Berry, Hayne Farm, Newton St. Cyres, Devon.
Captain F. W. Crawshay, Hempnall Cider Factory, Norwich.
Lythecourt Cider Press, Lythecourt, Tiverton, Devon.
W. M. Turner, Heath Barton, Pinhoe, Devon.
F. Wastie, Lawn Farm, Welland, Malvern, Worcs.
H. J. Phelps, Tibberton, near Gloucester.
G. H. Mayo & Sons, Waterwells Farm, Quedgeley, Glos.

The total number of authorized packers is now 77, consisting of 52 manufacturers and farm cider-makers, 2 associations of farm cider-makers and 23 bottlers.

National Mark for Bottled Fruit and Vegetables.—Despite the phenomenal growth in the output of canned fruit and vegetables in this country during the past three years, the glass pack has in no way lost its appeal, which is to the eye as well as to the palate. Exact figures are not available, but the commercial pack of bottled fruit and vegetables is probably as high as 10,000,000 bottles annually; there is also a large "domestic" output. The development of the commercial pack offers an additional outlet for supplies of high-grade home-grown fruit and vegetables of many varieties. It is to foster this movement that the Minister, at the request of growers and bottlers, has decided to extend the National Mark scheme to fruit and vegetables bottled on a commercial scale.

The new scheme follows generally the lines of the National Mark canned fruit and vegetables scheme, and provides for the voluntary grading of the bottled product by the packer to well-defined standards of quality, as detailed in Statutory Regulations made under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931. "Definitions of quality" have been prepared for a large variety of fruits bottled either in water or in syrup, and for vegetables bottled in brine. The list of fruits includes plums (selected varieties, including greengage, damson and damascene), cherries (selected varieties), blackberries, gooseberries, loganberries, raspberries and bilberries (whinberries, etc.), red and black currants and apples. The "statutory designation" for graded bottled fruit packed

under the National Mark scheme will be "Select" in each case, coupled with the name of the fruit and the indication "in water" or "in syrup" as the case may be. "Select" bottled vegetables will include peas, stringless beans (whole or sliced), asparagus, beetroots (whole or sliced), carrots (whole or sliced), turnips (whole or sliced), *macedoine* of vegetables, and rhubarb.

For the first season, the right to apply the National Mark to bottled fruit and vegetables will be restricted to applicants whose annual output exceeds 10,000 bottles. In granting applications, the National Mark Committee will be advised by the National Mark Canned and Bottled Fruit and Vegetables Trade Committee. It is a special requirement of the scheme that bottled vegetables shall be sterilized at high temperatures under pressure, and that all products shall have sufficient vacuum. In view of the almost complete standardization of the capacity of glass containers for bottled fruit, only the following sizes will be permitted under the scheme: 13, 20, 26, 40 and 80 fluid oz. capacity. As, however, the packing of many kinds of vegetables is still in the experimental stage in this country, no standard sizes of containers will be specified for the present in that connexion, though standardization of these containers will form an objective of the scheme.

Full particulars regarding the scheme, including definitions of quality for the various kinds of bottled fruit and vegetables, conditions of enrolment as "authorized bottlers," and method of application for enrolment, are given in Marketing Leaflet No. 29, copies of which may be obtained, free of charge, from the Ministry.

National Mark Scheme for Honey.—The value of honey produced annually in England and Wales in recent years is estimated at rather less than £200,000. Honey production is at present a much less important branch of rural activity in this country than in many other parts of the British Empire; moreover, its consumption is exceptionally low in relation to the population. There is, accordingly, scope for a substantial development of home production.

The methods in the past of marketing the home product, however, have militated against the possibility of increasing the home producer's share of the trade in important consuming centres. Honey marketing by bee-keepers has been carried on along individualistic lines; endeavours to standardize the product have been few and there has been a serious lack of organization for marketing purposes.

With the object of remedying these defects, the Minister has decided to introduce forthwith a voluntary scheme for the grading of home-produced honey to statutory standards and for marking the standard products with the National Mark.

Grade designations and definitions of quality will, after consultation with the various interests concerned, be prescribed for honey produced by bees from nectar in England and Wales, and will be given statutory effect in regulations under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931.

Authority to apply the National Mark to honey containers will be granted individually to commercial bee-keepers, packing stations and dealer-packers, and collectively to beekeepers' associations.

It is proposed that, in the initial stages of the scheme, individual authorizations shall be granted only to those who normally pack not less than 2 tons of honey per annum, but no minimum will be laid down in respect of an association or of its constituent members.

Full particulars of the scheme will be published in the near future in Marketing Leaflet No. 31, copies of which will be obtainable, free of charge, on application to the Ministry.

The Minister has appointed a Trade Committee, consisting of the following representatives of the honey trade, to advise the National Mark Committee and the Ministry generally in regard to the application of the Mark to honey, viz.:—The Rt. Hon. Sir Francis Dyke Acland, Bart. (Chairman), and Messrs. A. F. Abbott, H. C. Aubin, W. H. Clarke, G. W. Judge, J. E. Swaffield, W. W. Waite and E. Walker.

National Mark Plum Scheme.—An illustrated pamphlet (Marketing Leaflet No. 32) on the National Mark scheme for plums will shortly be available for issue. As already announced, this scheme will be limited in its operation to plums of certain varieties, for which there is to be one grade only—i.e., *Selected*. The approved containers will be standard types of non-returnables and returnables, of which the most generally used will probably be chip baskets of 4, 6 and 12-lb. capacity, together with 3-lb. baskets for dessert "Victorias" only.

The National Mark labels, which will be of the strip type, as first introduced for use with punnets in the National Mark Strawberry and Cherry Schemes, will be printed on issue with the grower's name or mark.

Publicity for National Mark Produce.—A contract has been arranged for the use, for a period of six months, of a certain number of head-rest spaces in third-class compartments on certain trains running between London, Birmingham and Wolverhampton and between London and Luton, on the L.M.S. Railway, for advertisements of National Mark beef, eggs and fruit. The advertisements consist of coloured pictorial posters printed on cotton fabric. Following a short break after Easter, the advertisements of National Mark beef in the Birmingham, Leeds and Bradford newspapers were resumed in the middle of April. In connexion with the Ministry's display at the Manchester Grocers' and Allied Trades' Exhibition, April 19-30, National Mark products were advertised in certain Manchester newspapers, and also in the *Grocers' Review*. A special issue of the latter journal contained an illustrated article dealing with the history of the National Mark movement, and a separate article on the National Mark Egg Scheme contributed by Mr. Stanley G. Shaw, F.G.I., a member of the National Mark Egg and Poultry Trade Committee.

London National Mark Eggs Window Display Competition.—

This competition, particulars of which were given in the April issue of this JOURNAL, was held in the week commencing April 18. In the normal course, retail traders and co-operative societies can hardly afford to devote a window for a whole week to a special display of a single commodity such as eggs. Nevertheless, many excellent window displays were arranged, and the task of the judges was not an easy one. The total entry was 117 shops. The competition has undoubtedly provided an exceptional opportunity for bringing National Mark eggs to the notice of thousands of Londoners in a most practical way. The winners of the four Silver Cups to the value of £40, £20, £15 and £10, respectively, offered by Mr. Gordon Selfridge, were as follows :—

- 1st Prize : Messrs. Waitrose, Ltd., 18, Golders Green, N.W.11.
- 2nd Prize : Royal Arsenal Co-operative Society, Ltd., 196 & 198, Upper Tooting Road, S.W.17.
- 3rd Prize : Royal Arsenal Co-operative Society, Ltd., 50 & 52, Rushey Green, Catford, S.E.6.
- 4th Prize : Royal Arsenal Co-operative Society, Ltd., 147, Powis Street, Woolwich, S.E.18.

In addition, cash awards of £8, £5, £4 and £3, respectively, were made to the window-dressers of the prize-winning displays.

Display of National Mark Produce.—At the Manchester Grocers' and Allied Trades Exhibition held at Belle Vue, Manchester, April 19-30, the Ministry had a stand for the display of National Mark commodities.

Orange Books on Marketing.—The Ministry has to announce that copies are no longer obtainable of the Orange Book on the Marketing of Cattle and Beef (Economic Series No. 20). This is the sixth Report of the Series to be sold out, and the number is likely to be increased in the near future by the clearance of all copies of No. 5—*The Co-operative Purchase of Agricultural Requisites*; No. 12—*Marketing of Pigs*; No. 19—*Markets and Fairs, Part III (Northern Markets)*; and No. 21—*Preparation of Fruit for Market, Part I (Apples, Pears, Plums, and Strawberries)*. Those desirous of obtaining copies of any of these numbers before it is too late would be well-advised to order them without delay from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller. The first two Reports mentioned are priced at 8d. each, post free, and the last two at 9d. each, post free. The Report on the *Marketing of Pigs* should be of particular interest at the present time.

In September last, an Orange Book was published on the *Marketing of Sheep, Mutton and Lamb in England and Wales* (Economic Series No. 29). The main recommendations of the Report relate to:—

- (1) An improved system of price recording for sheep and lambs. The existing systems do not generally distinguish the effects on price of the two important but independent factors—quality and carcass-weight.
- (2) A National Mark scheme for mutton and lamb on similar lines to the National Mark Beef Scheme. This would give the consumer a guarantee of both quality and origin; would facilitate buying and selling; and would provide a basis for advertising the home product. The producer would be educated as to the kind of carcass required by the market and an impetus would be given to the production of better-quality meat.
- (3) An organized system for regulating the flow of sheep and lambs to market. The Agricultural Marketing Act, 1931, provides the necessary legislative machinery for the formation of producers' organizations which might feed the big urban markets with supplies as required. A grading and marking scheme would facilitate operations by providing a basis of sale. The transfer of store sheep from breeding to feeding areas might similarly be organized.
- (4) The rationalization of slaughtering. The present decentralization of slaughtering deprives the livestock industry in this country of the advantages of mass-production methods that are enjoyed by overseas competitors.

In December, 1931, the Council of Agriculture for England supported the findings of this Report and recommended its members to do everything possible to bring its conclusions to the notice of farmers up and down the country.

The Report, which is copiously illustrated, should be in the hands of all producers, livestock traders, auctioneers, butchers, market authorities and others concerned. It has an added interest at the present time owing to the fact that Marketing Demonstrations relating to mutton and lamb, in which suggested grades and methods of applying the National Mark are illustrated in a practical way, will be staged at the Devon County Show, Tavistock, May 17-19, the Great Yorkshire Show, Leeds, July 12-14, and at the Royal Welsh Show, Llandrindod Wells, July 20-22.

The Report is obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or at the Ministry's Marketing Demonstrations, at the nominal price of 6d. net (post free 10d.).

New South Wales Rice Marketing Board.—Within less than a decade, the rice industry in New South Wales has been put on a commercial footing and Australia, until a few years ago a rice importer, is now a seller in the international market. Progressive marketing organization has paralleled a vigorous development of production.

In order to enable this industry to develop on sound lines, the rice growers of New South Wales, following a period of co-operative organization, applied the Marketing of Primary Products Act to rice in November, 1928. The Statutory Board set up under the scheme, with control over the purchase and sale of rice in New South Wales, has now completed three years of successful operation.

The general method of the Board has been to assemble the rice at its own depots, to make advance payments to suppliers at the time of delivery, and to co-operate with well-established millers in the processing and disposal of the product. By these means, the Board has rationalized the assembly and distribution of the crop.

The good relations which it had established with the millers, and its statutory backing, served the Board well in 1930, when it was faced with a crop which exceeded home needs by 10,000 tons. To avoid a carry-over, the Board, in conjunction with millers, entered the export trade and succeeded in establishing a market for its rice in several countries. The Board has also turned its attention to the home market, and has concluded that the *per capita* consumption of rice in Australia can be greatly increased by publicity. As a part of its activities in this direction, the Board has published a booklet of recipes for rice dishes.

The Board has appreciated the intimate connexion between production and marketing problems. By co-operation with the Department of Agriculture and the Irrigation Commission, it has brought to pro-

ducers the most up-to-date knowledge on varieties, preparation of the land and crop rotation.

Although, as stated by the Board's Chairman, organization in the rice industry was greatly facilitated by a tariff, and by the small numbers and territorial concentration of growers, "it is extremely doubtful whether the growers working through the agency of purely co-operative organizations and marketing their products on an uncontrolled market could have achieved anything like the same results as has been done by the Marketing Board with its statutory powers."

The German Maize Monopoly and Cereal Policy : *Object of the Monopoly.*—The German Maize Monopoly, set up under the Maize Law passed on April 1, 1930, has as its object the regulation of imports of maize and the maintenance of the internal price of that commodity. It is primarily intended, however, to benefit German producers of rye, with which imported maize competes as a feeding-stuff. The production of maize in Germany is almost negligible. By the Commercial Treaty with Jugo-Slavia, the Government was debarred from raising the tariffs on maize and the principle of an import monopoly was therefore adopted as an alternative. The validity of the Maize Law has, by decree of March 23, 1932, been extended until March 31, 1934.

Administrative Machinery.—The control of policy is vested in an Administrative Council of 15 members, seven of whom represent agriculture and three the trade, with a President and Vice-President nominated by and representing the Ministry of Food and Agriculture. To carry out the policy decided upon by the Administrative Council, a limited liability company has been formed, whose capital, amounting to 100,000 RM., has been provided as to 65 per cent. by the trade and 35 per cent. by the Union of Agricultural Co-operatives. Ten directors of this executive body are nominated by the trade and four by the co-operatives; the Chairman is nominated by the Ministry of Food and Agriculture. One vote is allotted for every 100 RM. of capital subscribed and a dividend of 1 per cent. above Reichsbank discount rate, with a minimum of 6 per cent., should funds permit, is the first charge on profits, any surplus passing to the Exchequer.

Method of Operation.—The Maize Monopoly has very wide powers. It can import and sell maize, prohibit importation by private importers, fix internal prices and regulate the distribution of maize among internal purchasers. In practice, however, it has not exercised all these powers and except during the first few months of its existence has interfered little with the conduct of the import trade. Importers are allowed to purchase from abroad, but must inform the Maize Office of the quantity imported and agree not to release the consignments without its consent.

In theory, all imported maize is offered for sale to the Monopoly and resold by it. In practice, however, the importer is permitted to sell his supplies when, where, in what form and on what terms he wishes, after he has paid a tax fixed by the Monopoly. The importer can, however, ask the Maize Office to sell on his behalf. But there is no movement of imported grain from the merchant's warehouse to the Monopoly's warehouse and back again.

The tax referred to depends in general on the relationship between the world price of maize and the level at which it is desired to maintain

the internal price. A "release" price is determined for each grade of grain and the actual tax or "premium" payable by the importer is the difference between the release price and the quoted Hamburg c.i.f. price. Thus, in April, 1930, the tax was only about 26 RM. per ton, whereas in April, 1931, it was 164 RM. per ton.

It will be noted that the premium is not based on the price actually paid by the importer, but on the recorded world price. The importer thus gains if he buys below the quoted price and loses if he buys above that price. In the case of dispute between himself and the Maize Monopoly as to the grade in which his grain is classified for taxing purposes, he can ask for arbitration. Having paid the tax he is free to mix the various grades.

Miscellaneous Activities.—To encourage organization in the poultry industry and to offset the increased feeding-stuff prices caused by its policy, the Monopoly established a system of supplying maize at cheap rates to certain poultry producers.* For every 100 eggs supplied to the "Frischei" Depots, i.e., the egg-packing stations operating in the German National Mark Scheme, the producer is given a certificate enabling him to secure 15 kg. of cheap maize, and similar privileges are given to State-recognized poultry stations and co-operative geese-fattening stations.

The Monopoly has also assisted in solving the potato surplus problem. Before the Monopoly, a group of starch factories known as the maizena group were manufacturing starch from imported maize, in spite of the fact that there was a surplus of German potatoes which could have been used instead. The Monopoly, therefore, arranged for the maize-starch industry to take over potato-starch at a premium from the potato-starch industry and in return agreed to pass on maize to the maizena group up to a quota of 6,000 tons per month at a tax of only 7 RM. per ton. A considerable part of the tax paid by the maize-starch industry has been devoted to expanding the market for potato-starch and by-products.

Italy : Meat Quota.—In order to protect the Italian live stock industry from imports of cattle on the hoof from countries on Italy's northern frontiers, a quota system has recently been applied to Italian slaughtering establishments; these are provisionally required to slaughter a minimum of 85 per cent. of national cattle. For this purpose, cattle are divided into two categories, those which have all their milk teeth and those with at least one adult fore-tooth, while national cattle are understood to be those which have not been officially branded at the frontier. The quota of 85 per cent. applies to both categories.

Cattle imported into Italy only account for about 10 per cent. of the total slaughtering of roughly 2,000,000 head, but the demand for imported cattle is concentrated mainly in five or six of the largest towns. The purpose of the quota, therefore, has been not only to assist the livestock industry, which was suffering from imports of cheap cattle into the north, but also to secure the uniform slaughter of a minimum of 85 per cent. of home-bred cattle throughout the country.

In putting the scheme into operation, advantage has been taken of the fact that all abattoirs in Italy must be registered. The veter-

* See this JOURNAL, September, 1930, p. 597.

inary director of an abattoir is required by Decree to keep a register of slaughterings for each week and to permit the slaughter of no more than the statutory percentage of imported stock for each person delivering cattle into the abattoir in any one week. The identification of imported cattle is simple (since all stock must be branded at the frontier) and the veterinary director is solely responsible in any case of dispute.

In addition to the restriction upon slaughtering, it quickly proved necessary to restrict the import of fresh, chilled or frozen meat by a later Decree, and imported meat must now be reckoned as a part of the residuary 15 per cent. quota on the basis of two halves or four quarters for each head of cattle. All meat imported into Italy is stamped as "Foreign Meat" by the Sanitary Authorities at the time of import and, to permit the enforcement of the quota Decree, must now pass through an abattoir before consumption.

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MAY ON THE FARM

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It is still spring, although the longer day and the amount of bright sunshine may give a feeling of summer ; yet the nights are frequently chilly and ground frosts are apt to occur till after the middle of the month. Such frosts can be particularly destructive to fast-growing early crops of potatoes and until near the end of the month anxiety in this respect is never absent. Nevertheless this is one of the most pleasant periods of the year on a farm.

Arable Land.—Work on root crops and bare fallows is the main activity. In the south the bulk of the mangolds, sugar-beet and marrow-stem kale are sown before the middle of the month ; in the north swedes take a more prominent place as a root crop and are sown at this time. In the drier and warmer parts of the country, swedes and turnips are sown later in order to avoid damage by mildew. Thorough cultivation of the soil in preparation for root crops is essential to the success of the crop, but at this time of the year some care must be taken to avoid too much loss of moisture. Preparation of the land in sections is advisable and the crop should be sown immediately the final seed-bed is prepared. A delay of one day, particularly in dry weather, may make a big difference in the germination of the seed and the regularity of the crop. The number of plants per acre is a most important factor in the size of a root crop, and without good germination in the first place and efficient singling later, a full crop cannot be obtained.

On arable land, dock digging is another operation that should have attention now. On many of the best grain-

growing soils docks thrive and produce an abundance of seed that ripens before harvest and is distributed over the land or is conveyed in straw to the manure and subsequently to the land. The fight against docks must be unceasing; the fleshy root is difficult to kill and the weed can be kept in control only by hand labour.

Finger-and-Toe Disease.—This disease, also often called Club-root, and sometimes referred to as Anbury or Canker, causes much damage to swede and turnip crops as well as to cabbages, kale, broccoli and Brussels sprouts on soils that are deficient in lime. Weeds like Shepherd's Purse and Charlock are also susceptible to attack and provide a means of perpetuating the trouble in the intervals between the cultivation of cruciferous crops.

Infected plants can readily be recognized by the enlarged growths or knob-like swellings found on the roots. These swellings are at first quite small. As the disease progresses they increase in size. When cut through the solid tissue is seen to be of a greyish colour, mottled with small, white, opaque patches; later the swellings become brown and decay. It is important to distinguish between these growths caused by Finger-and-Toe disease and those caused by the larvæ of the Turnip-gall Weevil; the latter causes small round galls, each of which contains a larva or grub in its centre.*

Finger-and-Toe disease is caused by a micro-organism and can be spread from field to field on the wheels of vehicles or the hooves of stock, but even greater infection can be brought about by the use of farmyard manure made when the stock are fed on diseased roots.

Control should be by prevention. The organism thrives best on sour or acid soils where lime is deficient. Inefficient drainage, by creating a sour condition, encourages the disease. The predisposing causes must be removed by drainage, where necessary, and applications of lime. It will often be found that some portions of a field are more subject to the disease than others; damp hollows are often worse than the rest of a field, and where such is the case extra lime should be applied on these areas. Lime should be applied in the rotation as early as possible before the susceptible crop is to be grown. It will be most effective if applied during the preparation of the land for corn, following the removal of the diseased crop.

*See the Ministry's Leaflet No. 303.

Lime applied immediately prior to taking a root crop will not have enough time to become sufficiently well incorporated with the soil. The quantity required will depend on the acidity of the soil and the severity of the attack ; heavy soils may stand dressings up to three tons of burnt lime per acre, but light soils may need dressings of only one-half this amount. There is a widespread opinion that superphosphate and sulphate of ammonia encourage the disease and that basic slag and nitro-chalk are beneficial. On land that is badly infested it is wise to lengthen the interval between susceptible crops by growing potatoes or mangolds.

Certain strains of turnips and swedes are reputed to have disease-resisting properties, and there are certainly some strains that suffer less damage than others. Where the disease exists, however, it is usually a sign of lime shortage, and the use of lime will so benefit other crops that its application will be well worth while. Full particulars about this disease and its control will be found in the Ministry's Leaflet No. 77.

Turning Stock Out.—It is a great relief when the time comes that stock can be turned out to find their own food, and thus reduce the cost of labour and feeding stuffs. Cattle that have been lying out all the winter get the greatest advantage of the first grass and need no hardening off. Cattle housed during the winter, on the other hand, must be turned out with care if bad results are to be avoided. Much depends on the age of the cattle, the kind of housing, their condition as to fatness and the state of their coat. Older cattle, by reason of their age, are better able to rough it than younger ones, but the condition of the coat will determine how far it is safe to keep them outdoors when the weather is not too warm at nights. Cattle in forward condition that have been kept closely indoors will have a thin coat and if turned out too early will certainly go back. Cattle wintered in open or partially open yards will still have their winter coat and are more easily hardened off by turning out for a few hours each day, gradually lengthening the time until they can be left out entirely without much disturbance of their condition. It is well to remember that bright sunny days are often followed by rather cool nights, whereas a cloudy day and a south wind—even though it threaten rain—may be a more likely forerunner of a mild night.

Young calves should never be turned out until the risk of cold nights is negligible. It is a real temptation when the

grass is ready and at its best, but late May or early June is soon enough.

Careful attention should be given to cattle when first turned out to young grass. There is usually a tendency to scour, but with healthy cattle this should soon pass away. Persistent scour with watery bubbles in the dung is indicative of John's disease. There is no reliable cure for this disease, and as the retention of affected animals may be the means of contaminating pastures, and in particular water supplies, where these are from ponds and streams, the sooner the trouble is diagnosed and the animals slaughtered the better it will be for the general well-being of the herd.

Sheep Shearing.—Sheep shearing will be general in a few weeks. The present low prices for wool are somewhat discouraging to flockmasters, but it is important that care should be taken to prepare the wool for market in as good condition as possible; foreign material like grass, hay chaff and other vegetable substances should be rigidly excluded and not tied up in the fleeces. Such materials are difficult to remove, and their presence in a number of bales spoils the reputation of home wools in general. Sheep washing before shearing is less common than before the war. There appears to be a preponderating opinion among co-operative societies and others in favour of the farmer selling his wool unwashed, i.e., in the greasy state, because the higher prices obtained for washed wool are not usually sufficient to compensate for the cost of washing and the loss of weight in the fleece. The farmer should be guided by his buyer or co-operative society in this respect, but it is certain that if wool is sold washed it should be properly washed and not more than nine to twelve days before shearing, and at shearing it should be quite dry. When preparing the wool for the market, the daggings, the stained and discoloured wool and all odd pieces should be excluded from the pack. The fleece should be properly rolled up, on a flat, clean surface. Each fleece should be spread with the inside down, folded in from the sides, rolled from tail to neck and tied with a band made by twisting a neck portion of the fleece. All wool kept on the farm should be carefully stored in dry places and should not rest against outside walls; it should be covered to keep out dust and be protected from rats and mice.

One genuine grievance of the manufacturer is the use of tar and pitch for marking the sheep. The British Wool

Research Association, after much experimenting, have recommended the following mixture for marking sheep in this country :—

Wool Fat	45	parts by weight
Lime Blue	5	" " "
Barytes	20	" " "
Emco (light paraffin spirit)	25	" " "

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NOTES ON MANURES

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Nitro-chalk.—Sugar beet, mangolds, kales, and in certain cases swedes, all benefit greatly from an application of quick-acting nitrogenous manure in the early part of the growing season.* The use of nitrate of soda or nitrate of lime, particularly in the drier districts and on soils poorly supplied with lime, and of sulphate of ammonia over a wide range of soil and climatic conditions, is well understood. Nitro-chalk, a newcomer among the nitrogenous fertilizers, is also well suited to this purpose, and a few notes on this product and some experimental results obtained with it may be of interest at this season.

Nitro-chalk is one of the new synthetic nitrogenous manures, and consists of a mixture of nitrate of ammonia and finely-divided chalk. Nitrate of ammonia contains one-half of its nitrogen in the nitrate condition, that is to say, in the same form as it occurs in nitrate of soda, and therefore immediately available for crop growth. The remaining half is present as ammonia, and is quite similar to the nitrogen of sulphate of ammonia in its action. There is $15\frac{1}{2}$ per cent. of total nitrogen in nitro-chalk, and about 48 per cent. of chalk, which is enough to enable the transformation of the ammonia nitrogen into nitrate to proceed without drawing on the supply of the soil. This is an advantage on those soils so poor in chalk that the constant use of sulphate of ammonia would ultimately lead to a state of acidity.

Although, strictly speaking, the two forms of nitrogen in nitro-chalk are of different degrees of activity, when used in the warm growing period of spring the nitrification of ammonia is so rapid that there is little difference between the two types. Only in cold spells early in the season will the ammonia be held in reserve till more genial conditions set in.

The following are some of the results of field experiments

carried out by the staff of Imperial Chemical Industries, Ltd., comparing nitro-chalk with other nitrogenous fertilizers :—

Crop	Year	Nitrogen applied : lb. per acre	Yield per acre			Significant difference
			No nitrogen	Sulphate of ammonia	Nitro-chalk	
Sugar-beet (as sugar) (tons)	1929	58	2.09	2.77	2.91	0.335
Sugar-beet (as sugar) (tons)	1930	58	1.58	2.32	2.32	0.17
Mangolds, roots (tons)	1928	55	17.16	23.00	22.00	3.69
Oats, grain (cwt.) ..	1928	23	15.9	22.1	22.1	2.18
Barley, grain (cwt.)	1928	23	12.5	16.9	16.2	1.99
Barley, grain (cwt.)	1929	23	26.7	31.8	31.6	3.41

These figures show that both sulphate of ammonia and nitro-chalk definitely increased the yield of the crops under experiment, but there was no significant difference between the two nitrogenous manures.

The effect of increasing applications of nitro-chalk was determined on kale and hay with the following results :—

KALE : TONS PER ACRE						
	Nitro-chalk (cwt. per acre)					
	0	2	3	4	6	9
						Significant difference
1929	9.52	15.30	—	18.87	21.93	— 2.7
1930	11.16	—	12.82	—	16.22	18.15 0.67
1931	12.82	—	17.56	—	22.64	24.80 2.99

The response of this leafy crop to nitrogen is striking, and persists up to very high levels of manuring. It is instructive to derive from the above table the increased greenstuff in cwt. obtained per 1 cwt. nitro-chalk at each level of manuring as follows :—

KALE : CWT. PER ACRE PER 1 CWT. NITRO-CHALK						
Level of Manuring with Nitro-chalk (cwt. per acre)						
	2	3	4	6	9	Mean
1929	.. 58	—	47	41	—	49
1930	..	11	—	17	16	15
1931	..	32	—	33	27	31

The performance varies with season, but is surprisingly well maintained at the higher levels. The mean increase over all years and levels is 32 cwt. green kale (say about 3 cwt. dry matter) per 1 cwt. nitro-chalk or 17 lb. nitrogen.

HAY: MEAN OF 16 EXPERIMENTS. CWT. PER ACRE

	Nitrochalk.	Cwt. per acre		Significant difference
	0	1	2	
Yield	46.4	53.0	58.4	1.9
Successive increases	—	6.6	5.4	
Increase per 1 cwt. nitro-chalk	—	6.6	6.0	

In the case of hay the rate of increase is well maintained up to a level of 2 cwt. nitro-chalk per acre, and averages 6.3 cwt. hay per 1 cwt. fertilizer—a rate of increase that is quite normal for other nitrogenous manures.

Charlock Control.—Charlock is one of the few weeds that is held in check by spraying on an extensive scale. Copper sulphate is the most usual spray, but there is a considerable amount of evidence that certain fertilizers have a repressing effect on this weed when they are used under favourable conditions. The fact that calcium cyanamide has caustic properties makes it suitable for this purpose. Young charlock growing in cereal crops presents a somewhat horizontal surface and a rough leaf to the dusty cloud of cyanamide, and the foliage suffers such damage that many of the plants may be destroyed. The smoother and more upright leaves of the cereals shed the dust, and though they may be slightly affected they soon recover and exploit the nitrogenous manure. These effects depend very greatly on weather conditions, and for the best results the dust should be applied early in the morning when the leaves are wet with dew and a hot dry day is likely to follow. The charlock plants should be in a young condition, have three to four well developed leaves, and the cyanamide should be evenly distributed by a dry sprayer at about 1 to 1½ cwt. per acre.

In Germany, this action of cyanamide is widely understood and about one-fifth of the cyanamide used is applied for the purpose of weed destruction. One must realize that in attacking charlock in this way a late dressing of nitrogenous manure is being applied to the cereal crop. In a few instances this may be injurious—for example, when good malting barley is the first consideration—but usually if the soil is not too rich the cereals will stand up to the nitrogen and show an increase in yield.

It is important to remember that the use of cyanamide for weed destruction in the growing crop is confined to cereals and grasses. It should not be used against charlock in roots or corn with clover underneath.

Method of Applying Fertilizers.—By far the greatest number of fertilizer experiments have been designed to test the effect

of manures on the crop when applied in the customary manner. The question whether the time of application or the method of application has any pronounced influence on the result has received much less attention. There are several reasons for this. When a certain method of application has got into practice, and therefore presumably falls in conveniently with the sequence of operations on the crop, a distinct effort is required to break away from it ; while the experimental methods required to test the time and method of fertilizer application require more than ordinary supervision in the field.

None the less, on the first point a considerable number of valuable experiments have been carried out, and have thrown light on the effect of nitrogen in relation to its time of application, on winter corn, on barley, and on sugar-beet. Phosphate and potash have been much less investigated in this respect. Whether these mineral manures are best applied well before sowing, or at sowing time, or what effect they have when unavoidably held over as top dressings has been little investigated.

The sowing of manures for cereals and other small seeds by a combined seed and manure drill might show some interesting differences if compared with the same manurial dressings given broadcast before drilling the seed.

Nitrate of Soda.—Until recently, the nitrate of soda that has been used with great success as a fertilizer for 90 years or more came entirely from Chile. Since the German synthetic nitrogen industry made its great expansion after the War a certain amount of synthetic sodium nitrate has been made and used on the Continent. It is of interest to know that synthetic sodium nitrate is now being made in this country at the Billingham works. It contains 16 per cent. of nitrogen and can be used with the same confidence as the natural nitrate.

PRICES OF ARTIFICIAL MANURES

Average prices per ton during week

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	9 0	9 0	9 0	9 0	11 7
" " Granulated (N. 16%) ..	9 0	9 0	9 0	9 0	11 3
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	7 0d	7 0d	7 0d	7 0d	6 10
Calcium cyanamide (N. 20·6%) ..	7 0e	7 0e	7 0e	7 0e	6 10
Kainit (Pot. 14%) ..	3 16	3 9	3 5	3 6g	4 9
Potash salts (Pot. 30%) ..	6 1	5 14	5 11	5 11g	3 8
" " (Pot. 20%) ..	4 7	4 1	3 17	3 19g	3 11
Muriate of potash (Pot. 50%) ..	11 9	10 17	10 11	10 18g	4 4
Sulphate " (Pot. 48%) ..	13 12	12 19	12 16	13 0g	5 5
Basic slag (P.A. 15½%)|| ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)|| ..	2 5c	1 14c	1 14c	2 1c	3 0
" (P.A. 11%)|| ..	..	1 9c	1 9c	..	..
Ground rock-phosphate (P.A. 26-27½%)|| ..	2 10a	..	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%) ..	3 2	..	3 7	2 17k	3 7
" (S.P.A. 13½%) ..	2 17	2 9	3 2	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	8 15	7 0	7 0	6 15	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 19b	5 5f	6 0	5 5	..

Abbreviations: N.—Nitrogen; P.A.—Phosphoric Acid; S.P.A.—Soluble Phosphoric Acid; Pot.—Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

* * * * *

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc. (Agric.),

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Prices of Feeding Stuff.—Users of feeding stuffs are concerned as to future prices of the commodities which they are accustomed to employ. It remains to be seen whether prices will be influenced by alterations in the exchange value of sterling or by the effect of the duties imposed under the Import Duties Act. This matter has been the subject of a review which appeared in the *Agricultural Market Report* of March 24 last. The conclusion reached, however, is that the situation is generally too obscure to permit of any confident predictions for the immediate future.

The price of wheat for stock feeding is not likely to be affected by the Wheat Quota arrangement so far as can be foreseen. No certainty prevails with reference to the quantities of barley and oats that may be available for importation into this country from abroad after the current year's harvest.

As regards maize, the outstanding feature of market prices for some time has been the relatively low rates ruling for maize and the various maize products. Abundant supplies have been available, mainly owing to the harvesting of very heavy crops in Argentina in the spring of last year. The crop was approximately 40 per cent. above the average of the preceding five years. For the forthcoming crop an even larger area has been sown, but the yield is still uncertain, and it is doubtful whether the yield per acre will be up to the average. The chances are that in spite of the increased area under crop the quantity available for export may, owing to drought, be less than last year.

There are still, however, the Balkan States and the United States crops to be reckoned. It is thought that the Balkan States may have more maize available for export than last year. Normally the United States consume the bulk of their own crop, but there is a likelihood that if prices here should prove sufficiently attractive, the United States might export maize to this country.

In view of the conditions of supply and the rates of exchange the writer considers that an advance of price to 4s. 10d. per cwt. for Argentine maize in February was not unreasonable, and is in accordance with the general position. Even with this advance in price, however, maize products are still the cheapest concentrated foods on the market. Maize at £5 per

ton means 1s. 2d. per unit of starch equivalent; maize meal at £6 5s. per ton is 1s. 5d. per unit; maize germ meal at £6 per ton is 1s. 5d. per unit; maize gluten feed at £6 7s. 6d. per ton is 1s. 6d. per unit; and flaked maize at £7 7s. 6d. per ton is 1s. 8d. per unit.

The other most notable feature of the feeding stuffs market is the relatively high price of millers' offals. Broad bran is quoted at £8 5s.; ordinary bran at £6 10s. to £7 per ton. These prices per ton mean that bran is costing from 3s. upwards per unit of S.E. Coarse middlings at from £6 15s. to £7 per ton represents 2s. 4d. per unit; while wheat itself at £6 10s. per ton is making only 1s. 9d. per unit. It is recognized that millers' offals are not valued by the feeder purely on their starch value. Bran for cattle, sheep and horses, and middlings for pigs, are staple foods, imparting a measure of safety to a ration and promoting the proper working of the digestive organs. When the prices are sufficiently low, they are foods that can be very fully employed with sound results; but at present the prices appear to be rather high, whether when compared with those of maize products or with the price of wheat. Price is mainly a matter of supply and demand. If feeders will look carefully to the compounding of their rations and reduce the proportion of bran and middlings where other foods may be safely substituted for them, the tendency should be to bring the prices more into line with those of other feeding stuffs. Moreover, the prices current for what the farmer sells in the form of milk, beef, mutton, and pork are such that the margin of profit, if existent, is so small that the utmost economy must be exercised in the purchase of foods.

When starch equivalent is costing approximately twice as much in bran as in maize products it is obviously to the advantage of the feeder to seek for opportunities of replacing the more costly article by the cheaper. With the single exception of fish meal, bran is, per unit of S.E., the most expensive food on the market, at current prices.

Maize Products as Foods.—Maize is essentially a food rich in carbohydrates or starchy matter. It is palatable and digestible, containing little fibre; but it is low both in protein and minerals. Provided that it is included in a properly balanced ration and the protein and mineral deficiencies are suitably corrected, it gives satisfactory results.

Maize germ meal is a by-product from a commercial process. The germ is rich in oil. After being separated out the germ is subjected to hydraulic pressure and a proportion of the oil

is removed. The oil content of maize germ products as sold for feeding may vary from about 4 to 10 per cent. The lower the percentage of oil, the more suitable is this feeding stuff for pigs, or for cattle on grass. In the case of pigs, the oil, having a low melting point, tends to produce a carcass with soft, yellowish fat. Maize germ is sold in the form of cake and cubes as well as meal. The cubes have proved popular for summer feeding on grass.

Maize gluten feed, in composition and feeding value, is more or less similar to beans. It is a by-product from the starch and corn-flour industry, and as it is mainly composed of the gluten, it is considerably richer in protein than the other maize products.

Flaked maize is prepared by cooking the maize and flattening it into thin layers or flakes by passing it between hot rollers. Woodman has shown that flaked maize is more digestible than raw maize. There is some loss of oil in the process of manufacture, and this, together with the effect of the cooking, results in flaked maize being safer to feed to pigs, so far as the effect on the carcass is concerned. It is a food specially well suited to young stock, calves, lambs, and little pigs, and also to animals in milk.

In view of its comparative cheapness the question arises how far maize itself may be safely employed in stock feeding at the present time. Several years ago Voelcker found that maize meal or kibbled maize might be fed to the extent of 6 to 8 lb. per head per day to dairy cows and fattening cattle, and at the rate of $\frac{1}{2}$ lb. to 1 lb. daily to adult sheep. Linton has pointed out that in the corn belt of North America maize is the only grain fed to horses, its deficiency in protein and mineral matter being adequately made good by using lucerne or clover mixture in conjunction with it. In this country maize has been satisfactorily used up to 10 lb. daily for heavy horses. The quantity was restricted to 2 lb. at the start and gradually increased. In this connexion, Fjord's method of experiment is interesting. Taking a farm where pair-horse teams were employed, oats were gradually replaced with maize in the concentrated rations of the "off" horses of the teams; the "near" horses acted as controls and continued to be fed on the standard ration. As the pairs did the same amount of work, the comparative efficiency of the two rations was measured by the horses' loss or gain in live weight over the period of experiment. 1 lb. of maize was found to be of about the same efficiency as 1.2 lb. of oats.

In regard to the feeding of maize to pigs there is a good deal of difference of opinion as to the effect on the carcass. There is reason to believe, however, that the maize germ product is the most likely to have a deleterious effect upon the carcass, and that flaked maize is the safest form to feed in any considerable quantity to pigs.

Scandinavian and Irish pig-feeders have been accustomed to employ a much higher proportion of maize in rations than feeders in England. The belief has been held that the use of separated milk along with maize counteracted any harmful effect of this grain food, and recent observation indicates that, where maize is included in a properly-balanced ration which contains sufficient protein and mineral matter, there is less likelihood of the carcass being adversely affected than has been generally believed.

Swedish experiments conducted by Professor Nils Hansson showed that an average of 11.66 lb. of separated milk fed along with 3.96 lb. of maize meal gave a live weight gain of 1.24 lb. daily in bacon pigs. This daily increase is sufficient to demonstrate that separated milk and maize meal fed in conjunction constitute, in themselves alone, a reasonably well-balanced ration for fattening pigs.

COMPOSITION OF MAIZE AND MAIZE PRODUCTS (PER LB.)

			<i>Dry matter lb.</i>	<i>Starch equivalent lb.</i>	<i>Protein equivalent lb.</i>
Maize	..	..	0.87	0.81	0.07
Maize germ meal	..	..	0.89	0.85	0.10
Maize gluten feed	..	..	0.90	0.76	0.19
Flaked maize	..	..	0.88	0.83	0.09

* * * * *

DESCRIPTION	Price per qr.		Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	6 5	0 10	5 15	72	1 7	0-85	9-6
Barley, British feeding ..	—	—	7 0	0 8	6 12	71	1 10	0-98	6-2
„ Canadian No. 3 Western ..	25 9	400	7 5	0 8	6 17	71	1 11	1-03	6-2
„ Persian	24 0	—	6 15	0 8	6 7	71	1 9	0-94	6-2
„ Russian	24 3	—	6 15	0 8	6 7	71	1 9	0-94	6-2
Oats, English white	—	—	8 0	0 9	7 11	60	2 6	1-34	7-6
„ „ black and grey	—	—	7 10	0 9	7 1	60	2 4	1-25	7-6
„ Canadian No. 2 Western ..	24 0	320	8 8	0 9	7 19	60	2 8	1-43	7-6
„ Argentine	18 3	—	6 8	0 9	5 19	60	2 0	1-07	7-6
„ Chilian tawny	22 6	—	7 17	0 9	7 8	60	2 6	1-34	7-6
„ Russian	22 9	—	8 0*	0 9	7 11	60	2 6	1-34	7-6
Maize, Argentine	21 6	480	5 0	0 8	4 12	81	1 2	0-62	6-8
Beans, English winter	—	—	6 0†	1 0	5 0	66	1 6	0-80	20
Peas, Indian	—	—	8 5†	0 17	7 8	69	2 2	1-16	18
„ Japanese	—	—	28 10†	0 17	27 13	69	8 0	4-29	18
Milling offals—									
Bran, British	—	—	6 10	0 19	5 11	42	2 8	1-43	10
„ broad	—	—	7 2	0 19	6 3	42	2 11	1-56	10
Middlings, fine imported ..	—	—	7 2	0 14	6 8	69	1 10	0-98	12
„ coarse British	—	—	6 10	0 14	5 16	58	2 0	1-07	11
Pollards, imported	—	—	6 5	0 19	5 6	60	1 9	0-94	11
Meal, barley	—	—	8 5	0 8	7 17	71	2 3	1-20	6-2
„ maize	—	—	6 2	0 8	5 14	81	1 5	0-76	6-8
„ „ South African	—	—	5 17	0 8	5 9	81	1 4	0-71	6-8
„ „ germ	—	—	6 7	0 13	5 14	85	1 4	0-71	10
„ locust bean	—	—	6 10	0 6	6 4	71	1 9	0-94	3-6
„ bean	—	—	8 0	1 0	7 0	66	2 1	1-12	20
„ fish	—	—	15 10	2 16	12 14	53	4 10	2-59	48
Maize, cooked flaked	—	—	7 2	0 8	6 14	83	1 7	0-85	8-6
„ gluten feed	—	—	6 7	0 15	5 12	76	1 6	0-80	19
Linseed cake, English, 12% oil ..	—	—	8 12	1 4	7 8	74	2 0	1-07	25
„ „ „ 9% „	—	—	8 5	1 4	7 1	74	1 11	1-03	25
„ „ „ 8% „	—	—	8 0	1 4	6 16	74	1 10	0-98	25
Soya-bean cake, 5½% oil	—	—	8 12*	1 13	6 19	69	2 0	1-07	36
Cottonseed cake—									
English, 4½% oil	—	—	5 5	1 3*	4 2	42	1 11	1-03	17
Egyptian, 4½% „	—	—	4 17	1 3	3 14	42	1 9	0-94	17
Decorticated cottonseed meal 7% oil	—	—	8 15*	1 14	7 1	74	1 11	1-03	35
Decorticated ground-nut cake 6-7% oil	—	—	8 15	1 13	7 2	73	1 11	1-03	41
Palm-kernel cake, 4½-5½% oil ..	—	—	6 12‡	0 14	5 18	75	1 7	0-85	17
„ „ „ meal, 4½% oil	—	—	7 2‡	0 14	6 8	75	1 8	0-89	17
„ „ „ meal, 1-2% oil	—	—	6 10‡	0 15	5 15	71	1 7	0-85	17
Feeding treacle	—	—	5 0	0 8	4 12	51	1 10	0-98	2-7
Brewers' grains, dried ale	—	—	6 15	0 15	6 0	48	2 6	1-34	13
„ „ „ porter	—	—	6 5	0 15	5 10	48	2 4	1-25	13

* At Bristol.

† At Liverpool.

‡ At Hull.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of March, 1928, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 24s. per ton as shown above, the food value per ton is 28 16s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 3s. 6d. Dividing this again by 25-4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1-39d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following usual prices:—N, 6s. 10d.; P₂O₅, 3s. 7d.; K₂O, 3s. 2d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	6 18
Maize	81	6.8	5 0
Decorticated ground-nut cake	73	41.0	8 15
„ cotton cake	71	34.0	8 5

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.54 shillings, and per unit protein equivalent, 1.84 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The “food values” which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1931. issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 8
Oats	60	7.6	5 6
Barley	71	6.2	6 1
Potatoes	18	0.6	1 9
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 11
Beans	66	20.0	6 18
Good meadow hay	37	4.6	3 5
Good oat straw	20	0.9	1 12
Good clover hay	38	7.0	3 11
Vetch and oat silage	13	1.6	1 3
Barley straw	23	0.7	1 17
Wheat straw	13	0.1	1 0
Bean straw	23	1.7	1 18

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d. net.

* * * * *

MISCELLANEOUS NOTES

It has been decided to continue, for another season, the British Goat Society's Scheme for the improvement of milch goats kept by cottagers, smallholders and **Stud Goat Scheme**, others of similar position. Such people are enabled under this Scheme to procure the services of first-class stud goats for breeding purposes at a maximum fee of 4s. per service. The stud goats used must have been entered, or be considered suitable for entry, in the Society's Herd Book, and they must have been bred from proved milk-producing stock.

Owners who wish to have their stud goats registered under the Scheme should make early application to the Secretary of the British Goat Society, Roydon Road, Diss, Norfolk, who will be pleased to furnish full particulars of the Scheme. Applicants need not be members of the Society. Entries must be received on or before May 21, 1932. Goats submitted for approval must be available for inspection after that date at the premises at which it is proposed they should stand at stud.

* * * * *

THE general index number of agricultural produce for March was 13 per cent. above the base period 1911-13, as compared with 17 per cent. in February and 23 per cent. a year ago. Cereals, fat stock and cheese were dearer on the month, but milk contract prices showed a sharp decline, which was primarily responsible for the fall of 4 points in the general index.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1927 :—

Month	Percentage increase compared with the average of the corresponding month in 1911-13.					
	1927	1928	1929	1930	1931	1932
January	49	45	45	48	30	22
February	45	43	44	44	26	17
March	43	45	43	39	23	13
April	43	51	46	37	23	
May	42	54	44	34	22	
June	41	53	40	31	23	
July	42	45	41	34	21	
August.	42	44	52	35	21	
September	43	44	52	42	20	
October	40	39	42	29	13	
November	37	41	44	29	12	
December	38	40	43	26	17	

Grain.—The price of wheat moved upwards during March, and at an average of 6s. per cwt. was 4d. per cwt. higher than in February, while barley and oats were dearer by 1d. and 2d. per cwt. respectively, the former averaging 8s. 3d. and the latter 7s. 5d. The index for wheat at 19 per cent. below pre-war showed a rise of 5 points, while barley and oats were both 3 points higher at 4 and 5 per cent. respectively above 1911-13. A year ago all three cereals were cheaper than in the base period, the index for wheat being 30, that for barley 3 and for oats 18 per cent. below pre-war.

Live Stock.—All descriptions of fat stock were slightly dearer on the month, but store stock usually sold at rather lower values. Fat cattle were nearly 1s. 6d. per live cwt. dearer and the index rose 2 points to 21 per cent. above 1911-13, but the advance of $\frac{1}{4}$ d. per lb. in the price of fat sheep was proportionately the same as in the base period and the index remained at precisely the pre-war level. Baconers averaged 5d. and porkers 4d. per score more than in February and higher indices were recorded for both classes, the former advancing 2 points to 3 per cent. below and the latter 3 points to 9 per cent. above 1911-13. The fall in the price of dairy cows was proportionately rather greater than in March, 1911-13, and the index fell by one point, while store cattle showed a reduction of 2 points. Both store sheep and store pigs were slightly cheaper on the month and the relative index numbers were lower, that for sheep being reduced 5 points to 9 per cent. below and that for pigs 9 points to 5 per cent. above the base level.

Dairy and Poultry Produce.—The addition to the contract price of milk which had been conceded to producers in each of the previous three months was not retained during March and in consequence the index number showed the considerable fall of 29 points to only 17 per cent. above 1911-13; the corresponding figure a year ago was 50 per cent. above. The index for butter was unaltered at 7 per cent. above pre-war, but cheese recorded a rise of 6 points to 38 per cent. above. As is usual at this time of year eggs cheapened further during March, but the decline of about 2 $\frac{1}{4}$ d. per dozen was proportionately less than in the base period and at 4 per cent. above 1911-13 the index was 2 points higher on the month. A year ago, however, eggs sold at 24 per cent. more than in 1911-13. Fowls and ducks were slightly dearer, but geese rather cheaper than in February, the combined index for poultry being unaltered at 23 per cent. above the base level.

Other Commodities.—Potatoes were slightly cheaper during the month, the average falling by about 4s. 6d. per ton, while the index dropped 11 points to 164 per cent. above pre-war. Hay also sold at lower values, a fall of 2 points bringing the index to 30 per cent. below the base period. Vegetables, however, were again dearer and averaged 116 per cent. above 1911-13. There was a further slight fall in the price of wool and the index number declined by 2 points.

Index numbers of different commodities during recent months and in March, 1930 and 1931, are shown below :—

*Percentage Increase as compared with the Average
Prices ruling in the corresponding months of
1911-13*

Commodity	1930	1931		1932		
	Mar.	Mar.	Dec.	Jan.	Feb.	Mar.
Wheat	12	-30*	-14*	-20*	-24*	-19*
Barley	-2*	-3*	2	3	1	4
Oats	-15*	-18*	-1*	2	2	5
Fat cattle	37	23	10	19	19	21
„ sheep	52	30	6	10	Nil	Nil
Bacon pigs.. .. .	90	24	-13*	-4*	-5*	-3*
Pork „	96	46	3	10	6	9
Dairy cows	30	30	25	23	21	20
Store cattle	26	25	17	21	23	21
„ sheep	48	31	1	Nil	-4*	-9*
„ pigs	125	75	20	27	14	5
Eggs	31	24	-7*	7	2	4
Poultry	52	47	39	27	23	23
Milk	55	50	50	54	46	17
Butter	37	18	10	8	7	7
Cheese	40	23	11	22	32	38
Potatoes	-24*	70	159	203	175	164
Hay	34	-9*	-23*	-25*	-28*	-30*
Wool	11	-20*	-21*	-20*	-22*	-24*

*Decrease.

* * * * *

THE Director of the Rothamsted Experimental Station again extends a cordial invitation to farmers' and farm workers' associations and clubs, chambers of agriculture, students' Summer Visits to culture and horticulture, societies and other interested organizations to inspect the experimental plots at Rothamsted and Woburn between now and the end of October. Mr. H. V. Garner and Captain E. H. Gregory will act as guides, and even if weather conditions

preclude a close inspection of the fields a profitable time may be spent in the demonstration hall erected last autumn.

The experiments at Woburn (where the soil is light) are concerned with the manuring of potatoes, sugar-beet, **kales**, malting barley, wheat and the use of green manures. On the heavy soil at Rothamsted attention is devoted to the manuring of arable crops, especially sugar-beet, potatoes, mangolds, **kales**, fodder mixtures, barley, oats, wheat, permanent meadow hay and new grass land. Rotation experiments are in progress comparing various types of straw manure with dung produced in the ordinary way, and different levels of manuring with nitrogen, phosphate and potash respectively. Other experiments deal with the effect of modern slags and mineral phosphates on arable land and hay land, crop diseases and pests and the laying down of land to grass. A novel feature this season will be the installation of electrical equipment.

If possible, arrangements for parties should be made well in advance, but no farmer need forgo a visit because he has been unable to fix a date. All communications should be addressed to the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

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THE trials which are arranged each year by the Ministry with the object of testing new varieties of potatoes for immunity from Wart Disease were again

**Trials of Potatoes
for Immunity
from Wart
Disease, 1931**

conducted in 1931 on the farm of the National Institute of Agricultural Botany, Ormskirk, Lancashire. The actual field operations and the taking of records were carried out by Mr. Harold Bryan, B.Sc., and Mrs. McDermott, of the Institute, but the trials were conducted on a plan approved by the Ministry.

Forty-one stocks were included in the second and subsequent years' test, of which 4 developed Wart Disease. Of the 45 entries for the first year's tests, 7 became infected in the field; 3 proved to be synonyms of existing varieties; 7 were too poor to judge and 35 were distinct varieties.

As in previous years, the results of the trials have been considered by a small committee composed of representatives of the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland, and co-ordinated with the results of the trials carried out by the two last-named Departments at Philipstown and Kilkeel respectively.

The Committee recommended the approval of 26 new varieties, but only 4 of these have actually been added to the approved list. In the remaining cases inclusion has been postponed until such time as the raisers have intimated that the varieties have actually been or will shortly be introduced into commerce. Descriptions are given below of 3 of the new varieties, together with those of 4 varieties which were approved as the result of trials carried out in previous years and which are now being introduced into commerce. A description of the remaining new variety ("Ranger") will be published at a later date.

The findings of the Potato Synonym Committee of the National Institute of Agricultural Botany have been accepted by the Ministry where recommendations as to the classification of new varieties as synonymous with existing varieties have been made by that Committee.

A list of the names of the more commonly-grown varieties which have been approved as immune from Wart Disease may be obtained on application to the Ministry.

EARLY VARIETY

"Arran Scout"

- Sprout* .. Blue, strong.
Tuber .. Thick oval; skin white; flesh white; eyes shallow.
Haulm and Foliage Prone, moderately strong, spreading; colour grey-green; leaf close; terminal leaflet drooping; leaflets large, long-broad, soft appearance, dull; secondary leaflets large, numerous, sometimes on primary leaf stalks; wings straight; slight reddish-purple mottling general.
Flowers .. None observed.

SECOND EARLY VARIETIES

"Cleveland"

- Sprout* .. Pink.
Tuber .. Round; skin white with red blotches; flesh lemon, hard; eyes shallow, red.
Haulm and Foliage Medium height, moderately strong, open, upright to spreading, irregular; colour medium green; leaflets small; secondary leaflets small and numerous; wings straight; stems thin, numerous, slight bronzing general.
Flowers .. Blue-purple tipped white, small; buds red.

"Cumnock"

- Sprout* .. Blue.
Tuber .. Oval; skin white; flesh white; eyes shallow.
Haulm and Foliage Medium height, open and spreading; stems strong, becoming purple towards maturity; leaf large; leaflets large, dark green and glossy, margins waved; secondary leaflets numerous.
Flowers .. White, profuse, stalks long; berries occur.

EARLY MAINCROP VARIETIES

"Doon Ideal"

- Sprout* .. Pink.
Tuber .. Kidney, flat; skin white; flesh white; eyes shallow.
Haulm and Foliage Moderately strong, upright to spreading; colour medium green; leaf close; leaflets small, roundish, top growth dense; secondary leaflets large and very numerous; wings straight; reddish-purple coloration general on stem.
Flowers .. White, numerous; orange anthers.

"Ochiltree"

- Sprout* .. Pink.
Tuber .. Oval to kidney; skin white with red blotches; flesh white; eyes shallow, red.
Haulm and Foliage Moderately tall, vigorous, upright, spreading towards maturity; colour dark green; leaf open, arched; leaflets fairly small, terminal leaflet drooping to perpendicular, soft, wrinkled, glossy; secondary leaflets fairly small and numerous; wings straight; stems green, numerous.
Flowers .. Very large, white, numerous, clustered; orange anthers.

LATE MAINCROP VARIETIES

"Doon Pearl"

- Sprout* .. Blue.
Tuber .. Round; skin white with pink tinge at heel end; flesh white; eyes medium.
Haulm and Foliage Tall, strong, open, upright; leaf close; leaflets long, pointed, fluted, hard, dull; secondary leaflets large and numerous; wings thick, crinkled; stems strong with reddish purple mottling.
Flowers .. White, profuse, long stalks, clustered, lasting; orange anthers.

"Glenshee"

- Sprout* .. Pink.
Tuber .. Oval; skin white; flesh white; eyes shallow.
Haulm and Foliage Tall, upright, spreading later; stems fairly numerous, slightly coloured; leaf open, rigid, midrib slightly coloured at base and at bases of leaflet stalks; leaflets medium green with waxy appearance, rounded.
Flowers .. Dark red-purple, tipped white, profuse; berries profuse; buds dark.

* * * * *

It was at one time possible for the Ministry to provide an account of the methods of narcissus and daffodil growing within the compass of one of its Leaflets, but this section of flower-growing has so developed, and to some extent become so specialized, within recent years, that

a Bulletin* is now necessary for the presentation of the available information.

This illustrated Bulletin, which has recently been published, deals with the treatment of the bulbs and the growing of flowers, and includes the results of an inquiry into the methods used in different parts of the country, together with the findings of the scientific workers who have made a study of the problems connected with the industry.

The subject is considered mainly from its commercial aspect and is treated in full detail, covering questions of soil and manures, climate, varieties, choice of bulbs, growing, picking and marketing.

* * * * *

THERE are important and far-reaching differences between the production of fruit and vegetables for the ordinary market and their production for canning. To **Fruit and Vegetables** the canner, fruit and vegetables are the **for Canning** raw material of an industry that is standardized in every department and which cannot adapt itself to a supply that varies in quality or quantity. This standardization is essential to the industry's continuance, but, given a constant supply of the right material, there is every chance of the industry providing an important market for the farmer and fruit grower.

The production of this special type of raw material necessitates, among other things, the use of special cultural and harvesting methods, the selection of varieties that are often unsuitable for the ordinary market, and, for many commodities, a new conception of marketing.

As a guide to the requirements of this growing industry, the Ministry has just issued a Bulletin† covering the many aspects of the new demand. This publication summarizes the findings of the researches on suitable varieties undertaken by the Fruit and Vegetable Research Station at Campden, and describes the methods of cultivation used by the most successful growers of these particular crops throughout the country. A special section is devoted to an exposition of the system of growing on contract. The Bulletin includes nineteen illustrations on art paper.

* Bulletin No. 44, *Narcissi Culture*, obtainable through any bookseller, or from H.M. Stationery Office, price 9d. (10d. post free).

† Bulletin No. 45, *Fruit and Vegetable Production for Canning*, obtainable through any bookseller, or from H.M. Stationery Office, price 1s. 3d. (1s. 5d. post free).

Empire Farmers' Tour in Canada.—Arrangements are being made by the British National Union for a tour of Empire farmers in the Dominion of Canada during the coming summer. As on past occasions, facilities will be afforded for a thorough investigation of agricultural conditions in the districts visited, while the industrial interests will not be overlooked. The party will leave Southampton on June 21, returning on or about August 12. Special interest attaches to this tour on account of the Imperial Conference at Ottawa, which will be in session during part of the time. A number of South African farmers are expected to avail themselves of this opportunity of visiting the Dominion, where many South Africans take agricultural courses. Inquiries relating to the tour should be addressed to the Secretary at 213 and 214 Moorgate Station Chambers, London, E.C.2.

* * * * *

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W.1, on Wednesday, March 16, 1932, Sir Wm. Dampier, F.R.S., presiding.

The Board considered a notification from the Kesteven and Lindsey Agricultural Wages Committee of a decision cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor, and proceeded to make an Order carrying that decision into effect. The minimum rates in the case of male workers of 21 years of age and over are:—*Waggoners*: 37s. per week of 58 hours in any week from May 14 to October 14; 52½ hours in the weeks in which Good Friday and Christmas Day fall and 61 hours in any other week. *Shepherds*: 35s. per week of 45½ hours in the week in which Good Friday falls; 55 hours in any other week in summer; 47½ hours in the week in which Christmas Day falls and 56 hours in any other week in winter. *Stockmen*: 36s. per week of 46½ hours in the week in which Good Friday falls; 56 hours in any other week in summer; 49½ hours in the week in which Christmas Day falls and 58 hours in any other week in winter. *Other male workers*: 30s. per week of 43½ hours in the week in which Good Friday falls; 53 hours in any other week in summer; 39½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter. In the case of *Shepherds* additional sums are payable in respect of the lambing season. The overtime rates for all classes of male workers of 21 years of age and over are 9d. per hour on weekdays and 11d. per hour on Sundays. In the case of female workers of 17 years of age and over the minimum rate is 5½d. per hour for all time worked. These rates came into operation on March 20, 1932, and will continue in force until March 5, 1933.

Copies of the Order in full may be obtained on application to the Secretary of the Agricultural Wages Board.

* * * * *

Enforcement of Minimum Rates of Wages.—During the month ending April 14, legal proceedings were instituted against two employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County	Court	Fines imposed £ s. d.	Costs allowed £ s. d.	Arrears of wages ordered £ s. d.	No. of workers involved
Lincoln					
(Kesteven)	Lincoln	2 0 0	—	20 5 0	3
Northampton	Kettering	2 0 0	—	11 17 8	1
		<hr/>	<hr/>	<hr/>	<hr/>
		24 0 0	—	£32 2 8	4

Foot-and-Mouth Disease.—Since the last issue of this JOURNAL went to press an outbreak of Foot-and-Mouth Disease has been found to exist at Cheriton, Kent. The existence of the disease was confirmed by the Ministry on April 18, and the movement of cattle, sheep, goats, pigs and deer within a distance of approximately 15 miles of the infected premises has been prohibited.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS OF ENGLAND AND WALES ENGLAND

The following are corrections of entries appearing in the lists of County Agricultural Education Staffs published in the issue of this JOURNAL for March, 1932.

Somerset

Somerset Farm Institute Staff

Vice-Principal G. G. Gregory, B.Sc. (Agric.),
N.D.A.

Warwickshire

Horticultural Organizer G. H. Nash, N.D.H.*

* Wholly employed by the County Council, but only partially on agricultural education work.

The following changes are notified :—

Berkshire: Mr. C. J. Pope, N.D.A., has been appointed Assistant Instructor in Dairying (temporary), *vice* Miss M. G. Woods.

Gloucestershire: Mr. J. U. Charlton has been appointed Assistant Instructor in Poultry-Keeping, *vice* Mr. G. W. Morley.

Somerset: Mr. H. H. Duckett, N.D.P., has been appointed Chief Instructor in Poultry-Keeping.

WALES

Montgomeryshire: Captain H. M. Leighton has been appointed Instructor in Poultry-Keeping, *vice* Mr. O. Bowen, resigned.

PRINCIPAL WHOLE-TIME MEMBERS OF TEACHING STAFFS AT UNIVERSITY DEPARTMENTS OF AGRICULTURE, AGRICULTURAL COLLEGES, ETC., IN ENGLAND AND WALES

The Horticultural College, Swanley, Kent

Mr. W. E. Shewell-Cooper, Dip. Hort. (Wye), N.D.H., has been appointed Lecturer in Horticulture.

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NOTICES OF BOOKS

A New Policy for Agriculture. By F. N. Blundell. Pp. xii+180. (London : Philip Allan. 1931. Price 7s. 6d.)

In this essay, written in the early months of 1931, Mr. Blundell outlines the general trend of a suggested Conservative policy for agriculture. Mr. Neville Chamberlain has contributed a preface in which he states that he is in close agreement with the general propositions advanced, though he does not share the author's view that protection must wait upon the completion of organization. The policy outlined has five main features :—

(i) The main consideration in a long-term policy must be the production of livestock and livestock products. To use the author's own words, " 'Meat and not wheat' should be the slogan of the future."

(ii) Nevertheless, as wheat has an importance in British agriculture greatly out of proportion to its total money value, it is vital to assist cereal growing in the present emergency. The author gives an excellent exposition of the policy of a wheat quota as an emergency measure.

(iii) As regards land tenure, the existing system has worked reasonably well, but is in danger of breaking down under the present emergency. As a means of easing the landowners' burdens, suggestions are put forward for concessions in the death duties on agricultural land. A special effort should be made to promote land settlement by small-holders, though not solely, or chiefly, as a means of absorbing unemployed.

(iv) Measures designed to facilitate the organization of marketing should be among the first steps in a long-term agricultural policy. The line of development of co-operation that is outlined, however, is the somewhat novel one of statutory trading societies of a new type, representing farmers, merchants and manufacturers, though action under the Agricultural Marketing Act is not excluded.

Several methods by which the State might stimulate the formation of these societies are mentioned, among which is that of confining the use of the National Mark to producer-controlled organizations, where practicable! The author himself, however, admits that he makes this latter suggestion with hesitation; the need for standardization of farm produce is so urgent as almost to condemn any measure that might slow down its progress.

(v) Protection by tariffs is advocated as the last step in a long-term agricultural policy, but, on the theory that tariffs cannot materially benefit the producer so long as he is unorganized, the author's view is that, generally, organization should precede protection. The hope of tariffs should be held out as an inducement to farmers to combine.

The style of the book is attractive and, in spite of the weight of statistics and the solid information that it contains, it is remarkably easy to read.

Wool Quality. By S. G. Barker, Ph.D., D.I.C., F.Inst.P., M.I.Chem.E., etc. Pp. 328. (London: H.M. Stationery Office. 1931. Price 21s.)

Under Dr. S. G. Barker, the Wool Industries Research Association has established a world-wide reputation for scientific technology: its laboratories have become the recognized centre for wool research in the Empire. The monograph under notice summarizes our existing knowledge of "wool quality"; and a great deal of this knowledge has been won by members of the research staff of the Association. In "quality" is summed up all the properties of wool that fit it for the various uses of divers manufactures—properties that have proved extremely difficult to define with any precision, although many of them are well enough known empirically as the result of centuries of industrial experience.

Much research has been directed to investigating the scientific reasons for sound commercial practices. This is an essential stage in the application of science to industry, since it is upon such a foundation that further advances in the commercial utilization of wool (or any other raw material) can be most securely built. Wool has now a serious rival in artificial filaments, although nothing that possesses the characteristic properties of wool—elasticity, crimp and felting power—is yet in sight. For the time being, therefore, and in all probability for a good many years to come, wool, despite the dim-

vantage of its extreme variability, will stand alone; and, provided that scientific research is well directed, it may retain its pre-eminence indefinitely. From the manufacturing standpoint, what is primarily needed, in Dr. Barker's view, is that research should be so directed as to give the manufacturer the opportunity of exercising his undoubted skill of design and manipulation in the production of a greater variety in fabrics, and possibly of some new type of material that would be most effective to meet the dictates of fashion and the demands of the market. The way to realize this end is to secure precise knowledge of the characteristics of different types of wool, of the degree to which these characteristics, either singly or in relation to each other, influence different manufacturing processes, and, finally, of the manner in which these characteristics can be accentuated or modified so as to improve any type of wool for particular manufacturing purposes.

Apart from definite changes in breed, it is only to a limited extent that the farmer can alter the characteristics of the wool that he grows to sell; but advances are possible, not only in preventing damage to fleeces, but in producing wool of greater uniformity and so reducing variability, which is a disadvantage to the manufacturer. In both directions the Research Association has set itself out to be of assistance.

Dr. Barker's book is hardly one for the farmer; but for technologists and research workers, whether their interest is primarily industrial or agricultural, the monograph should be of very great value.

Studies on the Genus *Pythium*. By Velma D. Matthews. Pp. 136. (London: Humphrey Milford, Oxford University Press. Chapel Hill: University of North Carolina Press. Price 13s. 6d.)

It is now some 25 years since the publication of Butler's "An account of the genus *Pythium* and some *Chytridiaceæ*" in the *Memoirs of Department of Agriculture of India*. With the passage of time and the increase of knowledge concerning these fungi, this account has become somewhat inadequate and out of date, so that a new monograph has long been needed.

Comparatively few species of *Pythium* are of economic importance, but the possibility of losses from "Damping Off" caused by some of them is ever present in the mind of the horticulturist. The book under notice, however, is one for the professional botanist and plant pathologist rather than for the grower, who will find comparatively little in it to interest him. To those for whom it has been compiled, the book will be found thoroughly useful, as it contains descriptions of all the known species of *Pythium* (including five new ones) and a bibliography of over 300 references.

The introduction includes a description of the methods used for isolation and cultivation, and a brief account of the main characteristics of the genus. A key is provided for the genera of the family *Pythiaceæ* and another for the species of the genus *Pythium*. A description of each individual species follows. Along with this are given the hosts and habitats of the species and forms described, and references to the relevant literature in each case. The plates, reproduced from line drawings, are 29 in number, 26 being original. They are a valuable feature of the book and are placed as near as possible to the appropriate text. The format is excellent, and there are no obvious misprints; but Dr. C. J. Binns has been wrongly regarded as a man. This monograph will doubtless remain for many years the standard work of reference on the group of fungi concerned.

Swine Enterprises. By L. Anderson, M.S., Associate Prof. of Animal Husbandry, Iowa State College, Ames. Pp. ix+458. 195 illus. (London: J. B. Lippincott Co. Price 10s. 6d.)

This book, profusely illustrated, is one of the American "Farm Enterprise" Series, intended primarily for the use of agricultural students. It consists of twenty-seven chapters or "Jobs," each dealing with a specific aspect of swine husbandry, *e.g.*, Job 3 is "Choosing a Breed to Raise." Each aspect is dealt with on the plan of "job analysis and problem method of setting up subject matter," and sets out a list of questions or problems for study and discussion: appropriate topics for debate, books of reference, etc., are suggested.

In these days when specialization is being so much discussed, it is interesting to reflect that in America "about the only hog farmers who specialize highly are the breeders of pure-bred hogs. The production of hogs, then, must be looked upon as a means of diversification, that is, an opportunity away from a one-crop plan. Hogs are kept on farms to utilize farm waste and to provide a market for farm-raised grains and forage. The swine enterprise, because of its flexibility, lends itself to the adjusting of production to take advantage of changes in the relative prices of farm products. This is particularly true with corn and hogs."

The book is a mine of information on pig husbandry in America, and may be recommended with confidence not only to teachers and students, but to the general farming community.

Dairy Bacteriology. By Professor Orla-Jensen, Ph.D., D.Sc., Translated by P. S. Arup, M.Sc., F.I.C. Pp. x+198. 67 illustrations. 2nd Edition. (London: J. & A. Churchill. 1931. Price 18s.)

Professor Orla-Jensen's well-known textbook has been carefully revised and brought up-to-date for this second edition, which will not only be welcomed by the dairy bacteriologists, for whom it was written, but will be found very useful by all interested in the dairy industry. The book maintains the high standard of Professor Orla-Jensen's other works.

The chapter dealing with the micro-organisms affecting milk is clearly written; and the notes emphasizing the necessity for cleanliness in preparing the cow for milking, and in all the subsequent operations, to avoid bacterial contamination, will be of particular value to dairy farmers who are attempting to produce milk of high hygienic quality. The causes of taints, etc., in milk and milk-products are explained very fully in a careful study of the normal and abnormal micro-flora of milk and butter.

Of special interest to dairymen are the notes on the preservation of milk and its treatment for direct consumption, including sterilization, pasteurization, and the general handling of milk for town supplies; while the cheesemaker may be recommended to study the information on the action of rennet and lactic acid in cheesemaking, the ripening processes of various kinds of cheese, and the causes of defects of cheese.

Modern Dairy Management. By G. Walworth, M.A., Dip. Agric. Pp. v+711. (Manchester: The Co-operative Union, Ltd., Holyoake House, Hanover Street. 1931. Price 16s.)

This work deals with all sides of the dairy industry, from milk production on the farm to the utilization of surplus milk at the factory for dairy products. Attention is drawn to the endeavour, in all branches of the industry, to produce pure milk of high quality. The author is of opinion that this object cannot be attained unless the producer is encouraged by adequate reward for the extra labour and cost entailed.

He cites bonus schemes that are operated by some of the more progressive dairy firms ; and discusses methods for the chemical and bacteriological control of milk. There is also a chapter of useful information on the sterilization of milk. Other matters dealt with concern the handling, bottling and distribution of milk, and the general lay-out of the factory. The book concludes with a survey of the different methods by which milk, surplus to liquid sale requirements, can be converted into dairy requirements. The information, set out in convenient form, should prove of considerable value to dairy students and factory managers.

Thomas Tusser. *His Good Points of Husbandry.* Collated and Edited by Dorothy Hartley. Pp. 195. Illus. (London, Country Life, Ltd., Price 21s.)

Most of the reviews of this reprint that have so far appeared have been concerned much more with the humane letters aspect of Tusser's writings than with their value as a record of contemporary agriculture. This is perhaps comprehensible at a time when the great body of the population is urban rather than rural, and probably explains also the curious re-arrangement of the matter which is apparent in this reprint. Tusser, as would almost anyone else who had a real acquaintance with farming, opened his disquisitions at September. The bad habit of re-arranging the matter was begun by the Editor of the first reprint of part of his work which appeared under the title of *Tusser Redivivus* in 1710. In that reprint a beginning was made with January, which certainly has the merit of being the first month in the year, although it marks no period in the annual routine of farming. Mayor, a farmer and writer on farming, in the reprint published in 1812, returned to September as the opening month. Miss Hartley has adopted the proceeding of re-arranging the matter to commence in the spring, and she opens with March. Here again, while this may be the natural end of one season and the beginning of another, it marks no point in the farmers' year. It would have been well had Tusser's original arrangement been adopted.

Again, Miss Hartley has omitted the monthly abstract which Tusser inserted for each month. There is, of course, some excuse for this, since the "Abstract" contains information of much the same kind as the "Husbandry" for each month ; but it seems hardly necessary to have so widely re-arranged the material as has been done here. Parts of Tusser's matter which appeared in the original as Forewords have been tacked on to the end of the reprint. Digressions that were inserted in certain months with some measure of propriety have been excised and form a sort of appendix, while the whole is illustrated with contemporary drawings, most of which, unfortunately, are taken from Flemish and other foreign sources instead of from English manuscripts or publications.

It is true that the farmers' year is much the same to-day as it was nearly 400 years ago. The seed bed has to be prepared and the seed has to be sown at much the same time of the year, and the harvest is gathered in the same months. The interest of this work, however, lies in showing that work, which was formerly done with the help of the crudest implements and hand tools, is now facilitated by the existence of modern implements and inventions. The introduction of field crops unknown to Tusser has also led to necessary and valuable changes in rotation. Besides Tusser's remarks upon farming, there is a great deal of advice relating to the conduct of the household, this indicating the changes that have taken place in the mode of life between the days of Elizabeth and those of George V.

It is curious, for instance, to read of a man setting out in August to buy a supply of dried salt fish to carry him through the winter,

and to learn that it was packed in peas straw to keep it dry, being turned from time to time to keep it from going mouldy. There is also one section devoted to daily diet and another to the farmer's feasts, providing an amusing commentary on contemporary as compared with modern manners.

On the whole, this reprint may be considered to be produced for popular reading rather than for the scholar or for the historian of agriculture. It would have been better, while producing so finely printed and illustrated a book, if the reprint had been made a complete reproduction of Tusser's work. It does contain a facsimile of the "Hundred Points," but not of the more important and extensive "Five Hundred." Further, the preface might have been a scholarly essay, setting out the historical environment of the book and its value to students, rather than a somewhat sentimental introduction that provides nothing of this character.

Chemical Embryology. By J. Needham, Ph.D. 3 Vols. Pp. xxii + 2120. 532 figs., 13 plates and frontispiece. (London: Cambridge University Press. 1931. Price £5 5s.)

This monumental work, designed to form a basis for a new branch of pure science, contains fact: collected from a very scattered literature, arranged so as to enable generalizations to be drawn and theories synthesized to cover the data obtained from independent analyses. As a manual of reference, it should prove invaluable to those engaged in the application of science to problems of animal life, such as methods of destroying the eggs of insects, incubating those of fowls or fish, embryonic nutrition in farm animals, abortion and immunity to disease. The early pages present an interesting historical account of the subject, with special reference to the development of the avian egg, the remainder of the work being concerned with the facts and theories of general chemical embryology. The following examples will serve to illustrate the importance of the work for agriculturists.

The conditions affecting incubation of the eggs of insects and the lower animals are outlined. The hatching of insects' eggs involves the absorption of water from their surroundings, a fact of some importance in the case of eggs of the Frog-hopper on sugar-cane and of Aphids. The eggs also require air in incubation, and the asphyxiation of insect embryos while still in the egg has applications in economic entomology. The effect of temperature may be considerable, and this is shown by the fact that the incubation period of the snail's egg varies from 21 days at 20° C. to 45 days at 45° C.

A complete account of the avian egg is given. Deficiencies in the formation of the white and shell may be rectified by adequate feeding of the thymus gland, which controls them. Salts of calcium affect shell formation in the following order—carbonate, sulphide, lactate, chloride and phosphate; deficient calcium in the hen's diet results in diminished hatchability on account of abnormalities in the respiratory exchange. The white of a hen's egg yields a hard white coagulum on heating, but that of birds hatching naked a soft translucent coagulum, the difference being due to the amounts of carbon dioxide and alkali present. The carbon dioxide in the air space is reduced from 2 per cent. in very fresh eggs to 0.6 per cent. after nine hours. The fresher the egg the more lactic acid it contains. The hen's egg, unlike that of the duck, is pervious to water, and increases in weight if placed in distilled water. Insulin in large quantities can be prepared from the fresh yolks of hen's eggs: this is used in the early stages of development before the pancreas in the embryo functions. Yolk colour can be affected by feeding: cayenne pepper gives a yolk coloured red by lycopin, while Shepherd's Purse produces an olive green yolk. The size of hen's eggs decreases from March to June and increases from July to February,

while in pigeons the male-producing egg of springtime contains less stored material than the female-producing egg of the autumn. Low hatchability in winter is due to low vitamin content and prenatal rickets: irradiation with ultra-violet light or administration of cod-liver oil are followed by a marked increase in hatchability. Effects of temperature on rate of development during incubation are most marked in the early stages. Higher mortality is induced by too great humidity than by too little; under the latter conditions the larger eggs can conserve their water better because they have thicker shells. The consumption of food by the chick embryo on the sixth day is equivalent to an adult man eating about 150 lb. of food per day. The immunity of egg white from bacteria is due to a toxic substance, which is destroyed by heat and carbon dioxide. No immunity occurs if the natural loss of carbon dioxide after laying is prevented, an important point in egg storage.

Growth curves of the embryo, foetal membranes and fluids in the pig, sheep and cow are shown, and the mode of growth in animals, together with the change in shape as they grow up, is described, e.g., a pig's head forms 22 per cent. of the total body weight at birth and only 6 per cent. in the adult, while the stomachs and intestines change from 3.6 per cent. to 4.8 per cent. respectively. The faster the growth rate the more proportionate is the growth, and the greater the variation between individuals: this has an important bearing on methods of selection in farm animals. Increase in length of body is brought about by growth in the middle region of the back. The part or organ developing at the most rapid rate at the time is affected most in future development by an inhibition of growth.

The sections on respiration and heat production contain many interesting facts. In animals where the young are born in an immature state (e.g., man or rabbit) there is after birth first a rise and then a fall in metabolic rate, whereas in guinea pigs, which are born in a mature state, there is continuous fall from birth onwards: in pigs (which are intermediate) it varies in different breeds. In early embryonic life the heat regulation of the body is not developed; a chick remains "cold blooded" up to about the nineteenth day of incubation and a pigeon until the sixth day after hatching; the heat regulation mechanism is not developed in rabbits, dogs and cats until about the fifteenth day, although it is fully developed in the guinea pig at birth. The zones of temperature to which an animal can adjust itself widen continually as development proceeds.

The form of excretion of nitrogen adopted by an animal depends primarily on the conditions under which the embryo has to live. Ammonia, urea and uric acid form a series in decreasing order of solubility. In a closed system such as a fowl's egg it is essential that the nitrogen should be excreted in an insoluble form (uric acid); if the avian embryo had to suffer from uremia and a constant headache before hatching (as it would if nitrogen were excreted as urea), natural selection would hardly have preserved it for our entertainment. The first substance retained in the mammalian circulation if the kidneys are impaired is uric acid.

One of the appendixes contains an interesting account of the biochemical development of the plant embryo. The proteins in seeds are mainly globulins, i.e., soluble only in dilute salt solutions. Seeds containing fats with the higher melting points are generally only found in plants growing in hot countries. Seeds with carbohydrates as storage products have the highest efficiency in the chemical energy of development, whereas those with fats show a 23 per cent. loss and those with protein a 36 per cent. loss.

The wide scope of this book will be evident from the above examples of the ground covered.

Agricultural Co-operation in Ireland: A Survey by the Horace Plunkett Foundation. Pp. xiv+224. (London: George Routledge & Sons Ltd. 1931. Price 7s. 6d.)

This survey, forming part of a series of surveys now being conducted by the Horace Plunkett Foundation, attempts to remove what is regarded as an ever-present difficulty—"that British agriculturists do not understand co-operation nor British co-operators agriculture." An historical and legal survey is followed by a detailed review of co-operative activity in all parts of Ireland.

The more analytical chapters deal with the structure, methods and problems, and the main types of collective effort. Chapter V on the Free State creameries is extremely valuable, in that it outlines the policy that resulted in the compulsory rationalization of creameries (on which the verdict on the whole is favourable) and gives a frank treatment of the efforts at the collective marketing of creamery products. The history of the Irish Co-operative Agency and the Irish Associated Creameries illustrates the dilemma of the voluntary sales control; a weak organization resulted in outside selling and competition for sales between the sales agency and its suppliers, while a larger organization found itself burdened with excessive handling costs and the virtual necessity of taking up speculative trading. In contrast with the joint selling schemes in the Free State, the experience of a regulatory type of organization adopted by the Ulster Creameries is instructive.

The chapter on credit shows that in Ireland, as in Great Britain, the problem of farm finance has not been solved by legislative action, and that a central credit corporation has practically been rendered ineffective by reason of the lack of adequate organization of borrowers, thus causing a serious problem in supervision.

As stated by the late Sir Horace Plunkett in the foreword, "this volume, with its full and impartial evidence of Ireland's agricultural co-operative achievement, its frank examination of lessons learnt by passing failures, its statement of problems yet to be solved, will help toward an understanding of the task elsewhere."

Year-Book of Agricultural Co-operation, 1932. Edited by the Horace Plunkett Foundation. Pp. vi + 540. (London: George Routledge & Sons, Ltd. Price 10s. 6d.)

Students of agricultural marketing have learnt to welcome the annual surveys of the Horace Plunkett Foundation. In the first chapter of this volume, the examination of agricultural co-operation as a whole in its relationship to the agricultural crisis shows that the movement is striving towards bigger things. In fact its protagonists envisage a new social order based on co-operation between producer and consumer and between nation and nation. The next chapter forms a fitting sequel to the first, since it shows the movement progressing from propaganda to a long-period educational policy, with agricultural co-operation using the up-to-date methods of film and radio to expand its field. The remainder of the book records and comments on the year's developments in various countries, dealing with the special problems affecting each. The account of the negotiations between English societies for closer co-operation among themselves and with the consumers' movement gives an indication of the undercurrents in the co-operative world to-day. The chapters on co-operation overseas emphasize the great difficulties that agricultural co-operation has had to face in recent years. The concluding part of the book is devoted to reviews and lists of marketing literature, and contains a useful synopsis of the year's agricultural legislation.

Co-operation in Marketing Dairy Products. By R. W. Bartlett, Division of Agricultural Economics, University of Illinois. Pp. xii + 299; 75 diagrams and illustrations. (London: Baillière, Tindall & Cox. 1931. Price 21s.)

This volume reviews in a wide and comprehensive manner the practice of co-operative marketing of dairy products in the United States. It is divided into two parts: Part I dealing with "Aims and Agencies" and Part II with "Price Plans." In the first part a short description is given of Producers' Associations, both of the collective bargaining and merchanting types, as well as of those engaged primarily in butter and cheese production. The author also deals with such topics as Producer Membership Relations, Trade Associations, Educational Agencies, Health Activities, Quality Control, and Transport Agencies. An interesting chapter is devoted to Dairy Marketing in Foreign Countries.

The second part of the book is of special interest to readers in this country in that it provides a convenient summary of the price structures adopted in different regional milk schemes in the United States. The price plans are clearly explained and illustrated by hypothetical examples. In each case, the merits and drawbacks of the plan are fully discussed. The author shows the tendency towards marketing concerns of regional and national scope and believes that the industry can be stabilized by the adoption of a price structure sound in principle and workable in practice, in conjunction with effective quality control to prevent the sale of low quality supplies. When such schemes have been put into operation, the next step, he considers, should be the study of factors governing production and consumption, in such a way as to be of practical assistance in adjusting milk prices.

The volume contains many valuable illustrations and statistical tables and a comprehensive bibliography is included. Altogether it constitutes a most useful work for anyone interested in the organization of milk marketing.

The Journal of the Orkney Agricultural Discussion Society. Vol. VI. 1931. Pp. 90. (Kirkwall: W. R. Mackintosh, Victoria Street. Price 1s.)

The current issue of this periodical contains articles on such varied subjects as cattle feeding, rearing and marketing, the seeding of grasses and clovers, butter and cheese-making, transplanting turnips, the construction of farm buildings, and the utility of ploughing matches. Two interesting debates are reported, one dealing with the respective merits of horse and mechanical traction, and the other with Free Trade v. Protection. A publication of this description should do much to stimulate intelligent progress among the farmers and agricultural students of the area with which it is concerned.

Index Londinensis. Tomus III (Earina-Iusticia. Pp. 555). Tomus IV (Kadsura-Pediceulia. Pp. 568). Tomus V (Pediularia-Sapium. Pp. 549). Tomus VI (Saponaria-Zymum. Pp. 571). (Oxford: The Clarendon Press. Price £5 5s. per volume.)

The issue of these four volumes completes a series that cannot fail to be of great service throughout the world. Its basis is Pritzel's *Iconum Botanicarum Index Locupletissimus*, published some seventy years ago, which has been thoroughly revised and continued down to the close of 1920. Needless to say, the delegates of the Clarendon Press have spared no pains in ensuring that printing and format shall be worthy of a work of such importance.

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NOTES FOR THE MONTH

THE following note has been communicated by Mr. J. F. H. Thomas, B.Sc., of the Royal Agricultural College, Cirencester :—

Prolificacy of It is generally accepted that the birth
Sheep : Records rate only partially determines the final
of a Small yield of lambs for disposal, though exact
Breeding Flock details of pre-natal and post-natal death

rates are not easy to obtain. Such details, however, have been carefully recorded for a small breeding flock kept on the farm of the Royal Agricultural College at Cirencester during the past five years. Three different types of ewe have been bred from, yielding an average rearing of 1.70 lambs per ewe mated. This relatively high yield is due to the association of a high birth-rate with a minimum loss. Unquestionably the small number of ewes kept has exerted a favourable influence upon fertility, as it has also led to a greater percentage survival of lambs.

Lambing has taken place during the months of February and March, and the lambs have been offered suitable concentrates in a "creep" in order to fit them for sale during May and June.

TABLE I.—SUMMARY OF BREEDING RESULTS

Year of mating	Breed of ewe	Number mated	Barren	Ewe deaths	Lambs reared	Average rearing per ewe mated
1927 ..	Suffolk	22	1	—	36	1.64
1928 ..	Suffolk	10	1	1	14	1.40
1929 ..	Half-bred	30	—	1	48	1.60
1930 ..	Half-bred	25	—	2	47	1.88
1931 ..	Kerry Hill	5	—	—	6	1.20
	Half-bred	18	—	—	38	2.11
	Kerry Hill	5	—	—	7	1.40
	Total ..	115	2	4	196	1.70

Two of the ewes died from septicaemia, while the other two casualties were due to pulmonary congestion (confirmed by post-mortem examination). Assistance during parturition

was given on three occasions only, viz., in one instance the removal of two dead lambs; two cases of malpresentation of the first lamb of a triplet, no loss of ewe or lambs resulting after the delivery of the lamb. In the five-year period under review, three different Hampshire Down rams were used, but in no single instance did the size of head in lambs impede delivery. All ewes have lambed adequately supplied with milk and no serious udder disorders have developed to inhibit suckling.

TABLE II.—RECORDS OF CONCEPTION, PRE-NATAL AND POST-NATAL DEATHS OF LAMBS

Year	Total lambs conceived	Born alive	Deaths before and during parturition	Reared	Post-natal deaths
1928 ..	39	38	1	36	2
1929 ..	17	14	3	14	-
1930 ..	54	51	3	48	3
1931 ..	67	62	5	53	9
1932 ..	49	46	3	45	1
Total ..	226	211	15	196	15

It will be observed that the percentage of live births to conceptions was 93·36, while the percentage born alive and subsequently reared was 92·88. A temporary shelter has been erected each year for lambing; the majority of the ewes have lambed in the open field, but have been transferred with their lambs to the pen for two or three days. This procedure probably reduced losses during the inclement weather which has been experienced each lambing season except that of 1932. No serious effort has been made to keep alive lambs that were born in a very puny state. The relatively heavy post-natal loss of lambs in 1931 was due to the birth of a number of weakly lambs, mainly as the result of a high proportion of triplet conceptions. It has been interesting to record the "primary" fertility of all ewes as indicated by the actual number of lambs conceived. In Table III is given a record of all conceptions, including an unborn twin in a ewe that died before the completion of gestation.

It will be seen that single, twin and triplet conceptions have been in the ratio of 1 : 2·44 : 1·08. The percentage not reared from twin conceptions was 9·01, and not reared from triplet conceptions, 23·45.

Throughout the year the ewes have been grazed on pastures,

TABLE III.—SINGLE, TWIN AND TRIPLET CONCEPTIONS

(Figures in brackets denote the number of individual lambs born dead or not subsequently reared.)

Lambing year	Breed of ewe	Singles conceived	Sets of twins conceived	Sets of triplets conceived	Sired by
1928 ..	Suffolk	5	14 (2)	2 (1)	Hants D (a)
1929 ..	Suffolk	2	6 (2)	1 (1)	Hants D (b)
1930 ..	Half-bred	10	16 (3)	4 (3)	Southdown
1931 .	Half-bred	—	13 (2)	12 (11)	Hants D (c)
	Kerry Hill	3	2 (1)	—	"
1932 ..	Half-bred	2	8 (1)	8 (3)	"
	Kerry Hill	3	2	—	"
	Total ..	25	61 (11)	27 (19)	

sports fields, and in poultry pens. Owing to the limited area available for stocking with sheep, and to the small size of enclosures, frequent changes of grazing have been made, special care being taken to avoid very close grazing particularly during spring and summer. As a result, there has been, up to the present, no need to resort to dosage as a means of controlling parasitic infestation. Constant care and attention have been necessary to control foot-rot. No effort has been made to produce a high birth-rate by flushing, except by the necessary changes of pasturage. Each year the same procedure has been carried out in feeding to supplement grazing. Commencing six weeks before lambing, small but increasing quantities of trough food have been supplied, the actual amount varying from $\frac{1}{4}$ lb. to $\frac{3}{4}$ lb. per head daily, and the same food was continued in larger amount after lambing. The following rations have given equally satisfactory results :—

Parts by weight.

- (a) Dec. Ground-nut Meal 1
- Crushed Oats 2
- (b) Extr. Soya-bean Meal 1
- Crushed Oats 2
- (c) Dec. Cottonseed Meal 1.5
- Crushed Oats 2
- Maize Meal 1
- Palm-kernel Cake 2
- (d) A compound milk ration cake, in cube form.

At from two to three weeks before the commencement of lambing a small daily quantity of mangolds has been supplied, sufficient to produce the desirable laxative condition in the ewes. After lambing the use of mangolds has been continued until supplies have been exhausted. Before lambing, hay has

been entirely withheld, or given in very restricted quantity, unless grazing has been inhibited by the advent of snow or severe frost; there has been no restriction in the hay consumption of ewes suckling their lambs.

The small number of losses during parturition may be partly attributed to this system of feeding, which includes suitably balanced concentrates and a limitation of the hay fed before lambing. It may be mentioned that the Suffolk ewes were one-crop, two-crop, and three-crop in 1927; the Half-breds were purchased as warranted three-crop ewes in 1929; the Kerry Hills were bought as theaves in 1930.

The results of these observations may be summarized as follows:—

- (i) The association of a high birth-rate with a low death-rate has resulted in a rearing of 1.70 lambs per ewe mated over a period of five years.
- (ii) Accurate breeding records emphasize the high prolificacy of the Half-bred ewe.
- (iii) Pre-natal and post-natal losses closely approximate.
- (iv) Pre-natal and post-natal losses of triplet lambs have amounted to nearly 24 per cent. of the total conceived; with twin lambs, similar losses have amounted to 9 per cent.
- (v) The feeding of suitable concentrated foods, and the limitation of the amount of hay fed before lambing appears to have exerted a favourable influence on breeding results.

* * * * *

THE process of jam-making is a very old one, and in its early form consisted in boiling fruit with a suitable proportion of added sugar. The boiling had to be done sufficiently long to free from the fruit a substance that set the jam firm. This substance is now known to be a chemical named "pectin."

Some fruits, such as blackcurrants and gooseberries, are very rich in pectin, and jam made of such fruits often sets too stiff; others, such as strawberries, contain only a small quantity of pectin, and the jam may be thin. Unfortunately, lengthy boiling splits up strawberries, with the result that no whole berries are left.

It was a natural development, therefore, that greater use should be made of added pectin (a) to reduce the time of boiling, (b) to economize in the amount of fruit used, (c) to secure a firm jam, and (d) to ensure that the fruits should be left in a more nearly whole and perfect condition.

For several years past pectin preparations have been imported from America, both in powder and liquid form, but British processes have now been worked out and factories have been opened for production in England. The pectin is

extracted from fruits such as apples, and is now available under proprietary names for the use of the general housewife in making jams.

Recipes for making jams are given in the Ministry's Bulletin No. 21 (published by H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 1s. net, or 1s. 2d. post free in paper covers, or 1s. 6d. net, 1s. 9d. post free, quarter bound). Whilst pectin products may not yet be very familiar to those who make jams at home, they have nevertheless been used to a considerable extent in making factory jams and should appeal strongly to those who are specializing in making jams in which the fruit remains whole.

* * * * *

FARMERS are reminded of existing facilities for obtaining weather forecasts issued by the Meteorological Office other than through the medium of the daily

Weather Forecasts Press.

for Farmers

Forecasts Broadcast by Wireless Telephony.—Weather forecasts for the

British Isles as a whole are prepared in the Meteorological Office and passed to the British Broadcasting Corporation for issue at the following times in summer: 10.30 a.m., 6.0 p.m. (week-days only), 9.0 p.m.

The first of these messages is normally broadcast in the National Programme at 10.30 a.m. daily, including Sundays. It contains forecasts for the next twelve hours for the whole of the British Isles (which may be divided up for this purpose into specified areas), and a "further outlook" if the conditions are such as to justify the issue of one. A notification of any anticipated spell of fine weather is always broadcast with this message. The forecasts are followed by a general statement of the positions of the chief areas of high and low barometric pressure, and a forecast for shipping.

The second of the messages is broadcast from all stations of the B.B.C. (i.e., all stations in Great Britain and Belfast, thus including both the National and Regional Programmes) at 6.0 p.m. (Sundays excepted). It consists of a short forecast of the weather of the night and the following day for the British Isles as a whole, with any "further outlook," and any notification of an anticipated spell of fine weather that may be issued. The forecast is of a more general nature than that issued at 10.30 a.m.

The third message is broadcast in the National Programme at about 9 p.m. and in the Regional Programmes at about 10.15 p.m. It is of the same general character as the 6.0 p.m. message, and refers to the same period of time, but it is based on later information. On Sundays it is broadcast at 8.50 p.m. from all stations.

It should be noted that the B.B.C. may alter the hours of broadcasting of these messages on individual days, but they normally announce any such changes both in the *Radio Times* and from the broadcasting stations.

Forecasts by Telegraph.—While the above issues of weather forecasts by wireless telephony are ordinarily sufficient for the

requirements of farmers, there may be some farmers to whom it is inconvenient to receive the broadcast issues, or who prefer to receive special telegraphic notification of spells of fine weather. For these the following provisions are still in force.

Two types of forecasts are issued by telegram :—

- (a) Notifications of the setting in and breaking up of spells of settled fair weather. For such messages when sent during the months of May to September a fee of 6d. per message is charged, plus cost of telegraphy ; in other months the fee is 2s. 6d. per message.
- (b) Regular daily forecasts covering a period of about 24 hours in advance. When possible an "Outlook" is added covering a longer period. The charge for this service is 1s. 3d. for each daily telegram in addition to a registration fee of 6d. for each week or part of a week for which the forecasts are required.

* * * * *

At the request of the Swanwick and District Fruit Growers' Association an interim report on the *Financial Results of Strawberry Growing in South Hants in 1931* (Survey Studies 2 ; Bulletin XLIII) has been issued by the University of Reading. The report includes information collected during a survey conducted by the

The Economics of Strawberry Growing Agricultural Economics Department of the University in collaboration with the Horticultural Department of the Hants County Council. Visits were paid to 560 growers, all members of the Association, but information sufficiently complete to permit calculation of the costs and returns of the crop was obtained from 350 only, and this is summarized in the present bulletin. The area covered by these 350 growers was 1,312.5 acres, the quantity of fruit sold during the year amounting to 1,797 tons, which is equivalent to an average yield of 1.37 tons per acre. Apart from family labour, receipts exceeded expenses by £9,058 14s. 2d., equal to a profit of £6 18s. 1d. per acre, or 0.54d. per lb. of fruit. Some growers, however, achieved better results, and, even after allowing a charge for domestic labour, were able to show an appreciable profit balance. It is hoped to publish a comprehensive account of the survey at a later date.

* * * * *

At the present time of the year one of the farmers' many problems concerns the disposal of the summer flush of milk.

Cheese-Making

The making of cheese is one solution, and the Ministry has recently issued a Bulletin* describing clearly and concisely those methods of cheese-making that have

* Bulletin No. 43, *Cheese-Making*, obtainable through any bookseller, or from H.M. Stationery Office, price 1s. (1s. 2d. post free).

been found by research and experience to be the most efficient.

The publication is in three main parts. The first deals with the principles and practice of cheese-making in general ; the second provides detailed instructions for the manufacture of the chief varieties of hard cheeses made in this country ; and the third is largely devoted to soft cheeses, the supply of which has, in the past, largely come from the Continent. There is no reason why good, soft cheeses should not be made more widely in this country, and there is a likelihood that the demand for these cheeses will increase in the future.

* * * * *

In the old days the only manner of eating celery in these islands was as a pleasant accompaniment to biscuits and cheese.

Celery- Growing

Occasionally it was also used as a flavouring for soups, but now its culinary uses are extending, and its virtues as a salad and as a cooked vegetable are widely appreciated. The consumption per head in this country is still short of that in America and on the Continent, but the acreage under the crop is steadily increasing.

The Ministry has recently issued a Bulletin* describing the methods of celery cultivation adopted by specialist growers, and giving the results of investigations by the staff of the Midland Agricultural College.

The subject is considered mainly from the commercial point of view, and the publication surveys all the operations from the selection of varieties to the marketing of the crop, but a short section is also included on celery-growing in gardens.

The Bulletin is illustrated and bound in a stiff paper cover.

* * * * *

SIR DOUGLAS NEWTON, K.B.E., M.P., has been appointed agricultural adviser to the United Kingdom Delegation to the Imperial Economic Conference at **Imperial Economic Ottawa**. Sir Douglas Newton is chair-
Conference, Ottawa man of the Conservative Agricultural Committee, a member of the Council of Agriculture for England and Wales (of which body he has been chairman), the Agricultural Advisory Committee for England and Wales, the Royal Agricultural Society of England and other agricultural organizations.

* Bulletin No. 47, *Celery-Growing*, obtainable through any bookseller or from H.M. Stationery Office, price 6d. (7d. post free).

VOLUME XV of the Register of Dairy Cattle has just been published. It contains particulars of 514 cows in respect of which Certificates of Merit have been awarded by the Ministry since October 1, 1931. This compares with 288 cows entered in the previous Volume. For a cow to be eligible for a Certificate of Merit it must normally have calved not less than three times during a period of three consecutive Milk Recording Years and have given, during those years, not less than the prescribed yield of milk, which for the three years ended October 1, 1931, was 30,000 lb. for Friesians ; 27,000 lb. for Ayrshires, Blue Albions, Lincoln Red Shorthorns, Red Polls, and Shorthorns ; 24,000 lb. for all other breeds or types except Dexters ; and 21,000 lb. for Dexters.

A statement is given showing the number and distribution of the yields of the cows of the various breeds entered in the Register, and the highest yield certified for each breed for the three years ended October 1, 1931. Of these cows 3 gave over 50,000 lb. of milk during the three years concerned ; 29 over 40,000 and under 50,000 lb. ; 59 over 35,000 and under 40,000 lb. ; 181 between 30,000 and 35,000 lb. ; 141 between 27,000 and 30,000 lb. ; and 52 between 24,000 and 27,000 lb.

Particulars are also given of pedigree bulls of proved milking strain. The condition of entry of a bull in the Register is either (a) that its dam and sire's dam have given the standard yield prescribed for their breed or type in any particular Milk Recording Year, or (b) that it has two or more daughters that have given not less than the standard yield prescribed for their breed or type in any particular Milk Recording Year. Entries relating to 20 bulls are given in the Volume, 9 of which qualified under condition (a) and 11 under condition (b).

A list of the Milk Recording Societies in England and Wales, with particulars of each Society and the name and address of its Secretary, is included in the Register.

Dairy farmers and others desirous of acquiring high-yielding milk-recorded cows that have been regular breeders should find the Register a valuable book of reference.

The Register is priced at 9d. and can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller. A copy of the Volume is issued free to all members of Milk Recording Societies.

MINERALS IN RELATION TO PIG-FEEDING

CHARLES CROWTHER, M.A., Ph.D., and T. S. WRIGHT, N.D.A.,
Harper Adams Agricultural College, Newport, Salop.

It has long been familiar knowledge to the pig feeder that rapid growth and fattening of pigs could not be obtained on a diet of cereals alone, but that the desired end could be secured if the cereals were supplemented by milk, either as whole milk or separated milk, and also, though to a less degree, by whey. Second only to milk products in their value as supplements to cereals came certain other foods of animal origin, such as fish meal and meat meal. A comparative study of the chemical composition of the cereals and of the animal substance of the pig's body quickly reveals two items in respect of which the cereals are only poorly supplied, viz., proteins and certain mineral ingredients, notably lime and salt. The supplements mentioned above are well equipped with these ingredients, the presence of which clearly affords a partial, if not entire, explanation of the efficacy of the supplements.

In recent years interest has been revived in the subject of mineral requirements of live stock and the possibility of dietary deficiencies arising under modern systems of management for high production. Out of this interest has developed a tendency to add indiscriminately to rations a small proportion of a mineral mixture, containing all the various ingredients ever likely to be short in practice, on the principle of insuring against all risks. It is extremely improbable that one would ever meet with a simultaneous shortage of all the necessary mineral ingredients in any ration used in practice, and it is an obvious economy, therefore, to adapt the mineral mixture, where used, to the needs of the animal.

With regard to the pig, observations at the Harper Adams Experimental Station and elsewhere soon led to the conclusion that in ordinary pig-feeding practice it would rarely be necessary to use anything more than lime, phosphate and salt in the way of mineral supplements, and a mixture of 6 parts of ground limestone, 5 parts sterilized bone flour and one part of common salt was found to give just as good results as the more complicated and more expensive mixtures commonly offered for sale.

In this simplified mineral mixture the most expensive ingredient is bone flour, which is included in order to safeguard the pig against a deficiency of the important bone-

forming element, phosphorus. An examination of the mineral composition of the cereals reveals, however, that although they are poor in lime and salt they are relatively rich in phosphorus; bran, indeed, is almost our richest food with respect to this element. It seems very unlikely, therefore, that with heavy rations of cereals the pig will ever suffer from a deficiency of phosphorus, but as the question is one that can only be decided by practical test, two experiments have been carried out at the Harper Adams College, the results of which are outlined below. The opportunity of these experiments was also taken to test the reality of the shortage of salt in the cereal diet, especially in view of the well-known sensitiveness of the pig to salt poisoning.

First Experiment.—To carry out this experiment three lots of nine Large White pigs were selected, each receiving the same basal ration of barley meal, tapioca meal, sharps and extracted soya-meal; the minerals given to the respective lots were as follows :—

Lot I : 6 parts limestone, 5 parts bone flour and 1 part salt.

Lot II : 11 parts limestone and 1 part salt.

Lot III : Limestone.

The total allowance of minerals to each lot was approximately 2 per cent. of the weight of the meals fed.

The twenty-seven pigs were home-bred and progeny of the same boar; at the start their average age was fifteen weeks, and the average weight per head in Lots I and II was approximately 56.5 lb., Lot III being a little lighter at 52 lb. Fattening lasted from October 24, 1929, to February 25, 1930, a space of about four and a-half months.

Recording of Weights.—Each pig was weighed individually at weekly intervals before the morning feed, so that it had fasted for 13 hours before entering the bridge. As is the custom at this centre the initial and final weights were ascertained by taking the mean of the weighings read on three successive days. Enough food for two meals per day was weighed out separately for each lot and mixed immediately after the morning feed, which was given at 7 a.m.

Management.—Before determining the initial weights all lots were dosed for worms, and a week was allowed for them to settle down in their quarters and become accustomed to the experimental ration. At the end of the first month each lot was divided into two pens, the four heaviest hogs being put together. To ensure good health the stock were permitted half an hour's exercise in the open each day, as well as a small quantity of green food.

Rations.—The rations, as already stated, were the same for each lot except that the mineral supplements differed as indicated above.

	<i>At the commencement</i> per cent.	<i>At the finish</i> per cent.
Barley meal	25	16
Tapioca meal	28	45
Sharps	35	28.5
Soya meal	10	8.5
Minerals	2	2

The costs per cwt. of these foods, including all freight charges, were :

	<i>s.</i>	<i>d.</i>		<i>s.</i>	<i>d.</i>
Barley meal ..	11	3	Soya meal ..	9	11
Tapioca meal ..	8	5	Limestone ..	4	9
Sharps ..	7	7	Salt ..	7	1
			Bone flour ..	12	0

Progress : 1st Period.—From the start of the experiment the pigs in Lot I (full minerals) and those in Lot II (without bone flour) developed in a very satisfactory manner. They fed well, gave good average live weight gains per week, and kept in excellent health, showing plenty of "bloom." No significant differences occurred between these two lots until about the tenth week. In comparison Lot III (receiving neither bone flour nor salt) recorded very poor progress. From the second week onwards this lot steadily fell behind the other two, and after the sixth week continued to do so with such startling rapidity as to leave no doubt as to the reality of the salt deficiency. During this period the animals in this lot had a very unthrifty appearance and ate spasmodically—for three or four days they would clear up each feed in 20 to 25 minutes and then for a few days would be indifferent to all food except the small allowance of greenstuff.

For the first ten weeks of feeding the average live weight increases were as follows :—

Lot I.	Lot II.	Lot III.
90.2 lb.	93.4 lb.	71.3 lb.

2nd Period.—At the end of the tenth week, in view of the unsatisfactory condition of Lot III, it was decided to give it salt in the same proportion as for Lot II, i.e., eleven parts of limestone and one part of salt. The stock at once responded to the slight alteration, their appetite showing a marked improvement at the first meal, doubtless due to improved palatability ; the result was that good weekly live-weight gains were recorded until the termination of the test, although the leeway lost in comparison with the other lots was never quite made up.

Live weight increases for the second period :—

Lot I.	Lot II.	Lot III.
74.0 lb.	81.7 lb.	85.4 lb.

As already mentioned there was little or no difference between Lots I and II during the first period, but the succeeding weeks showed Lot II (no bone flour) to advantage, so that after four and a-half months feeding they had gained nearly 11 lb. per pig more than Lot I.

Below are given the average quantities and costs of foods consumed per head :—

	Lot I.			Lot II.			Lot III.		
	lb.	£	s. d.	lb.	£	s. d.	lb.	£	s. d.
Barley meal ..	129.7	0	13 0½	129.7	0	13 0½	129.7	0	13 0½
Tapioca meal ..	236.2	0	17 10	236.2	0	17 10	236.2	0	17 10
Sharps ..	204.6	0	13 10½	204.6	0	13 10½	204.6	0	13 10½
Soya meal ..	68.2	0	6 0½	68.2	0	6 0½	68.2	0	6 0½
Minerals ..	12.7	0	0 10½	12.7	0	0 6½	12.7	0	0 6½
TOTAL ..	651.4	2	11 7½	651.4	2	11 3½	651.4	2	11 3½

Cost per cwt. meal 8s. 10½d. 8s. 9½d. 8s. 9½d.

Lb. live weight increase per head per week 9.57 9.73 8.70

Meal consumed per lb. live weight increase 3.85 3.72 3.91

Cost of food per lb. live weight increase 3.66d. 3.52d. 3.69d.

The differences between Lots I and II are too small to be regarded as significant, but we have evidence from other sources that the slight depressing effect of the bone flour on the rate of growth is probably a real one, though the reasons for it remain obscure.

Summary of Average Weights.

	Lot I.	Lot II.	Lot III.
	lb.	lb.	lb.
Initial weight ..	56.75 (9 pigs)	56.39 (9 pigs)	52.11 (9 pigs)
Total gain ..	164.25	175.13	156.68
Final weight ..	221	231.52	208.8
Fasted weight ..	216 (7 pigs)	224.1 (8 pigs)	215.3 (6 pigs)
Dead weight ..	183.1	188.9	175
Carcass as percentage of fasted weight	84 per cent.	84 per cent.	81 per cent.

Here again the weights leave little doubt with regard to the importance of an adequate supply of salt for the pig. Similarly they indicate that the omission of bone flour caused no harm since the results for Lot II, in all respects except that of carcass percentage, are distinctly superior to those of Lot I. The carcass percentages are determined from the weights taken before slaughter following a fast of 26 hours.

Second Experiment.—As a check on the first experiment a second test was started simultaneously with rather younger

pigs, and except for one or two minor details was a duplicate of the first.

The trial was made with three lots of ten pigs each, averaging about two months old; consequently the feeding period (nearly 25 weeks) was prolonged until April 15, 1930. The pigs were purchased locally and were the produce of a Wessex-Saddleback boar from Large White sows; they had an average initial weight of approximately 24 lb. per head. The management was identical with that of the first experiment.

The rations for the thirty pigs were as follows:—

	<i>At the start</i> per cent.	<i>At the finish</i> per cent.
Barley meal ..	25	70
Tapioca meal ..	23	—
Sharps ..	40	21
Ext. soya meal	10	7
Minerals ..	2	2

Tapioca meal was given during the first month only, after which it was replaced by barley meal. The proportions of the various constituents of the rations were gradually modified through the trial according to the age of the pigs.

The scheme of mineral supplements was precisely the same as in the first experiment (p. 202).

Progress.—The observations made ran closely parallel with those of the first experiment. No differences occurred between Lots I and II before the fifteenth week and then, although the latter obtained and held a slight advantage, the discrepancy was hardly significant. Lot III “did” badly after the first seven days and continued to fall away with disastrous results. This is reflected in the live weight increases as shown below, these being for 70 days:—

Lot I.	Lot II.	Lot III.
53 lb.	52.3 lb.	37.3 lb.

At the tenth week it was decided, therefore, to give them the same mineral mixture as Lot II, and the effects of the addition of the small quantity of salt were precisely similar to those observed with the older animals in the first experiment. Although the condition and general progress of the lots were satisfactory from the time of this alteration, an attempt was made to improve the rapidity of bodily increases of Lots II and III by the provision of more salt. The mineral mixture for both was changed at the beginning of the nineteenth week by reducing the proportion of limestone from eleven to five parts, whilst retaining the total supply of the mixture at 2 per cent. The average live weight increases for periods before and after this change are tabulated below:—

	Lot I. lb.	Lot II. lb.	Lot III. lb.
Av. live weight increase from 10th to 19th weeks	66.1	68.5	69.5
Av. live weight increase from 19th week to the finish	77.6	78.2	81.1

These figures do not show any appreciable effect of the extra salt, and suggest therefore that the very small allowance originally made was ample for the needs of the pig.

	Lot I.			Lot II.			Lot III.		
	lb.	£	s. d.	lb.	£	s. d.	lb.	£	s. d.
Barley meal ..	436.5	2	3 10	436.5	2	3 10	436.5	2	3 10
Tapioca meal ..	8.8	0	0 8	8.8	0	0 8	8.8	0	0 8
Sharps ..	221.7	0	14 6½	221.7	0	14 6½	221.7	0	14 6½
Soya meal ..	72.9	0	6 5½	72.9	0	6 5½	72.9	0	6 5½
Minerals ..	15.7	0	1 1½	15.7	0	0 8½	15.7	0	0 8
TOTAL ..	755.6	3	6 7½	755.6	3	6 2½	755.6	3	6 2½

Cost per cwt. meal	9s. 10½d.	9s. 9½d.	9s. 9½d.
Live weight increase per week ..	7.96 lb.	8.05 lb.	7.6 lb.
Meal consumed per lb. live weight increase	3.83 lb.	3.79 lb.	4.02 lb.
Cost per lb. live weight increase ..	4.05d.	3.99d.	4.23d.

Little comment is required, as the table is self-explanatory, those pigs without bone flour (Lot II) again showing to slight advantage. It is of interest to note that in this test the leeway lost by Lot III in the first ten weeks, owing to shortage of salt, was nearly made good after this deficiency was remedied. The pigs of this lot for the last fourteen and a-half weeks registered an average gain of 0.5 lb. per head per week more than Lot I.

	Lot I. lb.	Lot II. lb.	Lot III. lb.
Initial weight ..	23.63 (10 pigs)	24.25 (10 pigs)	24 (10 pigs)
Total gain	196.7	198.97	187.92
Final weight ..	220.33	223.22	211.92
Fasted weight ..	215 (9 pigs)	216.11 (9 pigs)	200.2 (10 pigs)
Dead weight ..	173	173.22	159.3
Carcass percentage	80.5 per cent.	80.1 per cent.	79.6 per cent.

The above summary shows that there were no significant differences between the lot in receipt of bone flour and that without. The ground lost in the first ten weeks by Lot III owing to salt deficiency is again clearly illustrated.

Carcass Quality.—In order to obtain evidence whether the mineral deficiencies had any effect upon the quality of the bacon fat the "Iodine Number" of the fat from each pig killed out of both trials was determined. The results summarized below show the usual wide individual variations in each lot, and little evidence of any significant differences between the

lots. Each lot contained one carcass with a soft fat which tended to raise the range of values.

		Lot I.	Lot II.	Lot III.
Experiment 1	..	54.8 to 60.93	57.85 to 61.08	57.12 to 59.44
Experiment 2	..	59.57 to 67.91	59.02 to 64.61	54.69 to 64.41

The sides of bacon from the first experiment were inspected and graded immediately curing had been completed, and later the hams from both trials were available for similar purposes.

The classification was :—

			<i>Experiment 1.</i>			<i>Experiment 2.</i>		
Lots	..	..	I	II	III	I	II	III
Bacon	..	..	A	A	B	—	—	—
Hams	..	..	A	A	B	B	B	B

The letter "A" represents first quality and "B" slightly inferior. The inferiority of the hams of Experiment 2 and of the carcasses of Lot III in Experiment 1 was due to the rather softer and more greasy fats, which, in the case of the former, had in some instances a mild, fishy taint.

Conclusions.—It would appear from the information gained from these two tests that under the conditions of our experiments, which can be said to be comparable with the common practice in the British Isles, the only mineral supplements required by pigs in a diet of cereals, wheat offals and soya meal are lime and salt. The common practice of giving bone flour not only adds unnecessarily to the cost of feeding, but may even be slightly detrimental. At the present time in this district the omission of bone flour effects an economy of 2s. 4d. per cwt. of mixed minerals, these costing about 62s. 2d. per ton.

Salt in small proportions is essential to maintain an adequate supply of sodium and chlorine for the efficient utilization of foods, and to ensure palatability. The amount must be carefully rationed, however, as the pig is notoriously sensitive to excess of salt.

As a result of these trials, the standard mineral supplement at the College during the past two years, for all feeding pigs and breeding stock, has been composed of two parts of limestone flour and one part of common salt. Criticisms have been put forward that poisoning might occur in young stock taking 3 per cent. of this mixture, but we have not as yet experienced the slightest trouble of this nature. Further experience may confirm, however, the indications of the second experiment that a much lower allowance of salt is sufficient.

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BACTERIAL CANKER AS A CAUSE OF DIEBACK IN PLUM TREES

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The Cause of Dieback in Plum Trees.—Year by year fruit growers in this country experience great losses from certain diseases in their plum plantations, particularly where the popular variety Victoria is grown. Of these diseases the most destructive are Silver Leaf and "Dieback." Silver Leaf, caused by the fungus *Stereum purpureum*, has been fully investigated in recent years by Mr. F. T. Brooks and his collaborators, and their recommendations have done much to keep this disease in check. The cause of Dieback, on the other hand, has been under discussion for many years. It has been attributed from time to time to various fungi or to unsuitable soil conditions, but no conclusive evidence has been submitted to prove that any of these could directly cause Dieback, as generally recognized. Only quite recently has it been established that the symptoms usually associated with Dieback can be induced by a parasite, as shown by positive results from inoculation experiments carried out with an organism isolated from diseased trees.

It seems probable that several distinct diseases have been included under the term "Dieback." Thus, trees growing in waterlogged soil may fail and die out, and others may be attacked by root-destroying fungi such as the Honey Fungus (*Armillaria mellea*). The most general type of Dieback, however, is that accompanied by the symptoms described below. One characteristic feature of this disease is the appearance of cankers on stems and branches; and as such cankers, during their formation, contain bacteria, and since they can be induced on healthy trees by inoculation with a bacterium, this form of Dieback is referred to as "Bacterial Canker."

Various fungi eventually appear on such cankers even while the affected trees are still alive, and some of these fungi have been suspected, therefore, of causing the death of the trees. Up to the present, however, inoculation experiments carried out with these fungi have not produced the typical Dieback symptoms, although there is evidence that one or two of them may sometimes assume weakly parasitic habits.

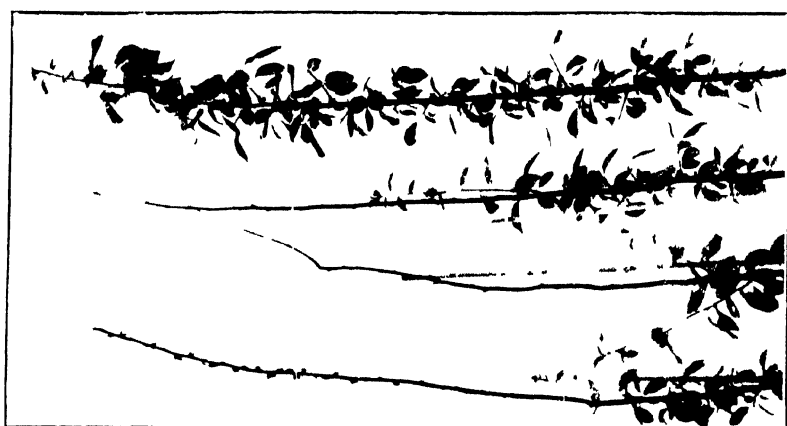
During the summers of 1924 and 1925 many trees on the trial plots at the East Malling Research Station were dead or dying, and these offered a good opportunity for investigating



FIG. 1.—Plum tree (variety *Czar*) showing symp-
toms of bacterial canker (yellow leaves, terminal



FIG. 2.—The same tree six weeks later, showing
the foliage completely withered.





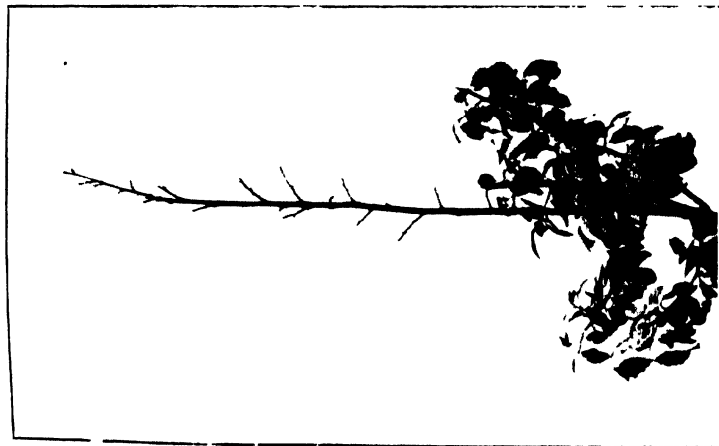


FIG. 7.—Tree inoculated in November, 1927. The tree became infected and the parts above the cankers died. (Photograph taken October 1, 1929.)



FIG. 8.—Tree inoculated in May, 1928. The inoculated wounds healed normally and no cankers developed. Tree inoculated in June, July and August showed similar resistance to infection. (Photograph taken October 1, 1929.)



FIG. 9.—Tree inoculated in November, 1928. Two cankers appeared, each 8 in. long; the upper one girdled the stem, killing the parts above. (Photograph taken October, 1929.)

the disease. The affected trees were dug up and examined. In nearly every case the roots were quite sound and well developed, so that the soil conditions could not be considered as a factor adversely affecting the trees. Moreover, other trees on the same plots were growing vigorously. Each diseased tree had a cankered area girdling the stem, and it seemed obvious that the canker had brought about the death of the tree.

Most of the cankers, as usual, bore fungi, but bacteria were also found in dense masses in the tissues of the bark at the upper and lower limits of cankers. The fact that the bacteria were in greatest numbers at the borders of the lesions, and that in such regions they were often found without any admixture of fungal mycelium, suggested that the bacteria were the primary cause of the cankers and that the fungi appeared secondarily as saprophytes on the tissues killed by the bacteria.

To obtain proof of the parasitism of the organism it was necessary to isolate it in pure culture and then to inoculate healthy plum trees with it, in order to ascertain whether it alone was able to produce the disease in the trees. Attempts to isolate the organism from particles of bark in which the bacterial rods were seen to be numerous were at first unsuccessful, and apparently the bacteria present in the tissues at that time (July and August) were dead. In 1926, however, it was found that the bacteria could readily be cultivated if the attempts at isolation were made in spring, during April, May or early June.

In October of that year ten young plum trees were inoculated with the organism isolated, while ten others, as controls, were inoculated with sterile water only. In the following spring the trees inoculated with the bacterium showed the typical symptoms of Dieback; cankers appeared on the stems, and during the summer the trees died from the region of the cankers upwards. The wounds on the control trees healed normally without any cankering, and the trees themselves remained quite healthy throughout that year and succeeding seasons. Inoculations made on branches and on one-year-old twigs have given similar positive results.

Definite proof has been obtained, therefore, that the Dieback symptoms and the death of plum trees can be induced by the bacteria that are to be found in the cankers. Further evidence that they are the primary cause of the cankering is offered by the fact that, as the bacteria cease their activities

in the cankers, and die out (as the culture tests have shown) during the summer, the cankers cease to increase in size, although fungi may be alive and flourishing on the cankered areas.

Symptoms of Bacterial Canker.—(i) The first sign that trees are affected with Bacterial Canker is to be observed in spring soon after the leaves unfold. On certain trees the foliage may be paler than on others. At first this difference in colour can hardly be distinguished except by a critical examination of trees of the same variety, and noting any that show foliage of a lighter green than that of adjacent trees. A superficial examination of the stem at this period may not reveal the presence of the lesion, which can be detected only by cutting into the bark at various levels to ascertain if it is discoloured.

(ii) The leaves of affected trees, in addition to their pale colour, are usually rather narrower than normal leaves and their edges are more or less curled upwards so that they have a "rolled" appearance. The normal development of the young shoots is usually checked; terminal shoots often remain quite short, growing out only two or three inches when those of adjacent normal trees are a foot to 18 inches long, and the spurs develop relatively few leaves. Thus the foliage of a cankered tree is noticeably "thin" when compared with that of healthy trees.

(iii) By June or July the yellowing of the foliage of an affected tree becomes more pronounced and the stem lesion can now be seen as a sunken area of bark often two to three feet long. On a tree with definitely pale foliage the canker will be seen to have girdled the stem for some distance along its length. The outline of the canker now shows up by reason of the growth of the tissues over the parts not invaded by the parasite, while the infected portions, making no growth, remain sunken below the general level of the surface. If a cut is made into the bark across the ridge which shows the limit of a canker it will be found that the diseased tissues, by reason of their dark brown colour, are sharply marked off from the healthy tissues.

When the outline of a lesion is indicated by the development of callus round its edge it no longer increases in size and this is associated with the dying out of the bacteria within the infected tissues. During July and August the bacteria may still be found in quantity in the bark towards the upper and

lower limits of the cankers, but attempts to isolate and cultivate them generally fail during the summer months.

(iv) Trees showing the characteristics described above will be found to be girdled in most instances, and in consequence they will die outright during the summer or autumn; the leaves wilt and fall early or they may remain on the trees, brown and withered, to the end of the summer.

Occasionally a stem canker, though it may be two feet or more in length, does not girdle the tree, which may, therefore, survive; in such a case the canker becomes very conspicuous in the course of a year or two, because of the thickened callus with which it becomes bordered. One tree was observed at East Malling which had a canker nearly three feet long (on a stem about $2\frac{1}{2}$ inches in diameter) extending from just below the crotch almost to ground level, but nowhere quite girdling the stem, although at one place it extended more than three-quarters round it, leaving a healthy strip about an inch wide. The tree, attempting to recover, produced well-developed callus round the canker and survived two summers, but it succumbed eventually during a gale which caused the stem to break across at its weakest place, where the canker had nearly girdled it.

Duration of the Cankers.—These bacterial cankers on plum trees, therefore, are not perennial in their development. Their formation is limited to one season and unless they girdle the trees during the first season following infection the lesions tend to heal over. The cankers are usually on the stems themselves, and when they extend round the stems cause the death of all branches and foliage, leaving only the rootstock and roots alive. If the stem is affected towards its upper end the lower part may remain alive, and healthy shoots grow out from dormant buds situated on that part of the stem below the canker.

A canker sometimes involves one side of the upper part of the stem and the bases of some of the main limbs at the crotch, when a portion only of the tree is killed. In other cases a canker appears on an individual branch, and such a branch is killed without the infection passing to the rest of the tree. When only a portion of a tree is affected the foliage on the parts above the canker shows the symptoms described and the rest of the tree remains normal in appearance and general health.

Losses Caused by Bacterial Canker.—This disease is particularly severe on the varieties *Victoria* and *Czar*. On one

plot, planted up at East Malling in 1921, 78 out of 241 Victoria plum trees (or 32 per cent.) became infected and had to be removed during the years 1922 to 1926. On another plot of 187 Czars, 19 trees (10 per cent.) perished from 1928 to 1930, whilst on an adjoining plot out of 51 damson trees (Bradley's King) 22 trees, or 43 per cent., were killed or severely cankered during the four years 1928 to 1931.

On commercial fruit farms the disease is no less severe; thus in one season (1928) a grower in the Weald of Kent lost about 25 per cent. of trees in a plantation of Czars. Every year specimens showing the symptoms of Bacterial Canker are sent in from various parts of the country by growers who complain of severe losses.

Most of the varieties of plums commonly cultivated in this country appear to be susceptible to this disease. Victoria and Czar are perhaps the varieties that suffer most, and the damson Bradley's King has proved to be very susceptible at East Malling. Other varieties that have been recorded as being attacked are Burbank's Giant Prune, Golden Drop, Warwickshire Drooper, Bastard Victoria, Prince of Wales, Farleigh Cluster Damson, President, Rivers' Early Prolific, Evesham Wonder, Pershore Egg, Purple Egg, Belle de Louvain and Denniston's Gage. Of these, some varieties, such as President, Rivers' Early Prolific and Denniston's Gage, have but rarely shown infection at East Malling, although growing on the same plots as Victorias and Czars that suffered severely. The disease has not yet been recorded at East Malling on the varieties Utility, Monarch and Diamond.

Bacterial Canker is apparently to be found in most districts where plums are grown in this country. It is destructive not only in Kent but also in the plum-growing areas of Cambridgeshire and Worcestershire, and trees killed by this disease have been received from growers in Surrey, Sussex, Hampshire, Dorsetshire, Buckinghamshire, Gloucestershire, Lincolnshire and Cumberland.

The Disease on Nursery Trees.—Bacterial Canker is sometimes very destructive to young trees in the nursery, and maiden trees have been known to suffer severely. On maiden trees the symptoms are very much like those already described for older trees, but their stems are more easily girdled and some trees are killed early so that they make no growth whatever in the spring. Others die soon after the buds burst, while some again may come out into full leaf, but if their stems are girdled by cankers the foliage withers during the

summer. On such trees there will usually be found a region on the stem, a few inches to a foot or more long, on which the buds are dead and so do not grow out when the other buds develop into shoots. On cutting into the bark of this part of the stem it will be found that the tissues are brown, indicating that this is the cankered region. If the canker does not reach the base of the stem the buds below the canker will be stimulated to grow out into long vigorous shoots and the contrast between these lower, green, healthy shoots and the yellow or withered foliage of that portion of the tree above the canker is very striking.

Infection on Leaves, Shoots and Fruit.—In plantations and nurseries where Bacterial Canker is causing damage the plum trees that do not show the symptoms associated with canker may bear foliage that becomes spotted during the summer. Spotting on plum leaves is due to more than one cause, but one kind is caused by bacteria. Such spots are circular, brown and, in the younger stages, usually bordered by a paler ring, which is best seen when the leaf is held up to the light. The spots are mostly about one-tenth inch in diameter, but two or more may run together to form larger patches. The infected tissues finally drop out, so that the leaves are pierced by holes that give a "shot-hole" effect to the foliage. Young trees may have nearly every leaf perforated by "shot-holes" in this way.

Blackened elongated lesions may also sometimes be found on the young shoots; in severe cases, especially on young trees when the shoots are sappy and growing quickly, infected shoots may be girdled and killed.

In 1926 when leaf-spotting was very severe on one of the plum plots at East Malling, bacterial spots were also found on the fruit. The spots were from one to five on plums showing infection, but very few fruits showed the spotting and this form of disease in itself is not considered as a serious menace to the crop.

Such lesions on leaves, shoots and fruit are found to be permeated with bacteria that ooze out in gelatinous masses when a young spot is teased out in water under the microscope. Cultural and inoculation tests have shown that the organism present is similar to that found in the cankers. It would seem then that, as the bacteria die out from the stem and branch cankers, other individuals become established on the young green organs that are formed during the spring and summer, thus enabling the organism to survive and

multiply, until, in the autumn, it is able again to infect woody stems and branches.

The Critical Period for Stem Infection.—As already remarked, field observations have shown that the bacterial cankers cease to increase in size during late spring and summer, and attempts at isolation have indicated that the bacteria in the cankers actually die out during late summer. It appeared probable, therefore, that severe infection of the stems took place only during a certain limited period of the year, and it seemed desirable to ascertain the particular period during which woody branches and stems might be infected.

With this end in view inoculations (using pure cultures of the organism) were made monthly on young plum trees. In each case cuts were made in the bark and drops of a suspension of the bacterial growth in water inserted. The inoculation experiments have been carried out during three years and the conclusions drawn from the results are as follows :—

- (i) Infection takes place readily during the months October to January.
- (ii) In February and March infection may also occur and cankers may arise, but they are considerably smaller than those resulting from infection during the preceding four months, and in consequence are much less likely to girdle the stems.
- (iii) Inoculations made about the middle of April gave little or no reaction and no definite cankers appeared.
- (iv) When inoculations were made in May, June, July and August the wounds healed normally with no trace of cankering.
- (v) Inoculations made about the middle of September gave results similar to those of the April inoculations.

It would appear then that from the middle of April to the middle of September the stems and branches of plum trees cannot become infected. The months when infection results in most severe damage are October, November and December.

Inoculations made on the young growing green shoots during the summer gave rise, however, to blackened lesions, and this result corresponds with field observations, which indicate that the organism spends the summer on the young sappy organs (shoots, leaves and fruit) that are developing during that period.

The Organism causing Bacterial Canker of Plum Trees.—The organism, which isolation and inoculation experiments

have shown to be the cause of Bacterial Canker, is a rod-shaped bacterium, the individual rods being about one ten-thousandth of an inch in length. In common with other



FIG 10.—*Pseudomonas mors-prunorum*, drawn from a preparation stained to show flagella. $\times 2000$.

bacteria the rods rapidly reproduce themselves by elongating and dividing into two. The bacteria, under favourable conditions, are capable of swimming about in liquids by means of one to three flagella, attached to one end (*pole*) of the rod. The organism is, therefore, a species of *Pseudomonas*. It has been compared with other organisms causing diseases in fruit trees, and is considered to be one that has not been described previously, and hence the name *Pseudomonas mors-prunorum* is proposed for it. It is closely related to *Pseudomonas prunicola*, which has been described recently as causing a wilting of young plum shoots in this country, but the two can be distinguished by certain cultural tests.

Bacterial Canker on other Species of Fruit Trees.—Bacterial cankers have been found on species of stone fruits other than plums, e.g., sweet cherry, Morello cherry and peach. Bacteria have been isolated from stem and branch lesions on these hosts and are being compared with the plum bacteria. Preliminary tests for identifying them have been applied, and the results so far as they have gone indicate that in most cases the damage on these species of fruit trees again is caused by *Pseudomonas mors-prunorum*.

The disease is often very destructive in young plantations of sweet cherries, and older trees may lose branches from the same cause. Bacterial cankers on cherry trees usually exude gum copiously, so that one of the causes of gummosis in cherry trees is a parasitic bacterium.

Control Measures.—Recommendations for keeping this disease under control can be given only tentatively at the

present stage of the investigation, but the knowledge that has been acquired respecting the behaviour of the causal organism in the plantation suggests that success may be looked for along certain lines of attack.

Sanitary Measures.—The removal of sources of infection is not so likely to have the desired effect in bacterial canker as where damage is caused by fungi, as, for example, in the Silver Leaf disease. In the latter, infected trees and branches can be detected and their removal effected before they become a source of danger to other trees, that is before the fungus produces its fructifications and begins to disperse its spores. *In Bacterial Canker the organism is active and reproducing itself during the winter and early spring before the trees are seen to be diseased.* By the time the affected trees show the symptoms clearly the organism is already losing its activity and soon dies out, so that to remove affected trees during the summer, from the end of June onwards, is unlikely to have any effect whatever in checking the disease. It is recommended, therefore, that in plum plantations (particularly where Bacterial Canker has already been serious) a good lookout should be kept in early spring for the first symptoms of disease as indicated by the pale foliage. Any trees that come under suspicion should be examined carefully, and if (by cutting small notches) the bark is found to be discoloured over a large area, and particularly if it is found to girdle the stem, such trees should be dug up immediately and removed. These precautions are recommended because it is believed that some of the bacteria in the cankers reach the leaves and so start the leaf spot stage that enables the organism to live and reproduce during the summer.

Time of Pruning.—Care should be taken not to prune off the side shoots of young trees or to cut back branches of older trees during the critical months of infection, which, as shown above, are October, November and December. It was observed at East Malling that where Victoria plum trees were cut back in October (to make room for pear trees with which they were interplanted) infection arose at very many of the pruning wounds, resulting in severe cankering of the branches, killing many of them the following year.

Summer Spraying.—Autumn infection of stem and branches probably arises from bacteria washed down by rain from leaves infected with the leaf-spot stage. The organism has been isolated from leaf spots as late as October 7, showing that it is alive in the leaves then, and as the stems become

susceptible to infection about that time it is reasonable to suppose that the leaves are a source of infection for the stems.

It is suggested, therefore, that attempts should be made to check the spread of bacterial leaf spot in summer by spraying with Bordeaux mixture. This method would probably be most effective for nursery trees. One nurseryman, who was recommended to try this method against a similar disease in cherries, states that it has been successful in checking gummosis and canker.

Autumn Spraying.—To reduce stem and branch infection in autumn growers are recommended to try the effect of spraying thoroughly with Bordeaux mixture (10 : 10 : 100) the bases of the branches, the crotch, and stems of plum trees in plantations where the disease is prevalent, the application to be made towards the end of September and again a month later.

Top-Grafting.—Another method for checking outbreaks is being tried at East Malling. Some varieties of plums are more susceptible to stem infection than others and attempts are being made to produce trees of which the framework (stem, crotch and main branches) consists of a resistant variety which can then be top-grafted with a more valuable but more susceptible variety.

Summary.—(i) The chief cause of Dieback in plum trees in England is Bacterial Canker; the parasite is a rod-shaped bacterium that has been named *Pseudomonas mors-prunorum*.

(ii) The disease symptoms shown by trees with Bacterial Canker are :—

- (a) The foliage is yellowish; the edges of the leaves curl upwards; and a stunting in the growth of young shoots is usually well marked.
- (b) The infected areas on stems and branches show up in summer as elongated cankers.
- (c) Trees that become girdled by cankers die during the summer following infection.

(iii) The organism may infect also the leaves (to form leaf-spots), shoots and fruit.

(iv) Infection of the stem readily takes place during October, November and December; during the summer months the stem is resistant to infection.

(v) Methods for controlling this disease are suggested.

SOME ASPECTS OF THE CREEPING THISTLE

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THE Creeping Thistle (*Cirsium arvense* Hoffm.=*Carduus arvensis* Curt.) is the most troublesome and expensive grassland weed. On the average farm, thistles have to be cut each year, the operation being regarded as part of the routine farm practice. The disappointing feature of the usual annual cutting is that it rarely causes an appreciable diminution of the weed even when it is carried out twice or is done at the time generally believed to be the most favourable. Seeding is prevented and an act of good husbandry is carried out, which, like hedge trimming, gives the farm a tidy appearance. The expense of cutting thistles varies with the degree of infestation and the method of cutting. An average infestation means an expenditure of about 2s. 6d. per acre each year for cutting once, when a scythe is used, and the majority of grassland farmers have to face this expense each year on their long leys and permanent pastures.

Germination.—No records can be found as to germination trials carried out in this country on the seed of the creeping thistle. It is often said that the seeds rarely germinate, and that the clouds of thistledown sometimes seen are really harmless, or nearly so. It is obvious to many practical men, however, that a certain proportion of the seeds must be capable of germination in some years, because heavy infestations with young thistles are frequently seen in fields just laid down to grass, after having been under a rotation of crops and thoroughly cleaned. (This weed is one of the injurious weeds specified in the Schedule to the Corn Production Acts (Repeal) Act, 1921.) "Seeds" of the Creeping Thistle were collected in the autumn of 1930, stored in a dry place during the winter, and germination tests by the porous plate method carried out on them the following June. Table I gives the results of these tests.

Each sample consisted of the "seeds" from one "head" only. Thus the "seeds" in the various samples had germinations varying between 0 and 50 per cent., the mean of all the seeds being 12.6 per cent. No sign of germination was apparent until the 8th day, and a number of seeds did not germinate until the 16th day.

It is known that two types of flower heads are produced by

TABLE I.—GERMINATION RESULTS WITH "SEEDS" (ACHENES) OF CREEPING THISTLE

Date of collection of seed	Centre	Number of seeds in test	Germination percentage
August 4	A	45	0
"	"	42	0
"	"	90	38
August 18	B	69	0
"	"	53	0
August 24	A	51	50
"	"	101	1
September 5	C	26	0
"	"	98	8
"	"	74	8
October 17	A	76	0
"	"	97	43
October 26	"	37	0
"	"	65	3
	Total ..	924	Aver. 12.6

the Creeping Thistle. In one type female flowers only are produced, while in the other both male and female parts of the flower occur. Both types are capable of producing fertile seeds, but it is the female type which bears the bigger proportion. In all the heads collected for these germination tests a number of empty seed cases or husks (pericarp) occurred; these were all either flattened or shrivelled, indicating that they were unfertilized. Seeds that were obviously well ripened were reddish brown in colour and had a fairly high germination capacity. Plump seeds that were yellowish-white in colour failed to germinate.

It is often asserted that the ripened seed is not carried far by the pappus or down, the "seed" dropping in close proximity to the parent and the down floating away harmless. Even after storing in a dry place for eight months, however, a large proportion of the "seeds" adhered to the down when pulled from the head, and they varied considerably in the ease with which they parted from the down. It is likely that in the field, where the conditions are more moist, the seeds would remain attached more firmly to the pappus, and might adhere sufficiently long to be carried considerable distances.

Habit of Growth.—The Creeping Thistle takes its name from its habit of spreading underground by creeping rootstocks. The spread by means of the root system may be very extensive in favourable soil, and, if an attempt is made to follow up these roots, it will sometimes be found that the thistles over

several square yards are connected together and must have arisen from the same seed or rootstock, as the case may be. Some of the seedlings from the germination tests were grown in pots until about a month old, and then transplanted into a garden soil of a sandy nature. Some of these plants were taken up at intervals for an examination of the rooting system, care being taken to lift the plant in such a way as to cause the minimum amount of damage to the roots. Fig. 1 shows a plant 100 days old (i.e., from the time of germinating the seed) photographed against a 12 in. scale. It is very difficult to remove the plant from the soil with sufficient care to prevent tearing off some of the roots; even under these conditions, however, the roots extend to a depth of about 18 in. It is probable that the plant would have developed a stronger rooting system if it had not been subjected to the set-back of two transplantings.

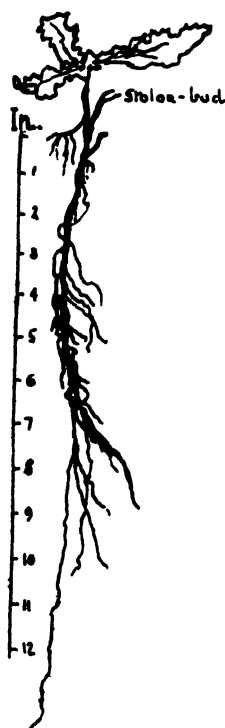


FIG 1.

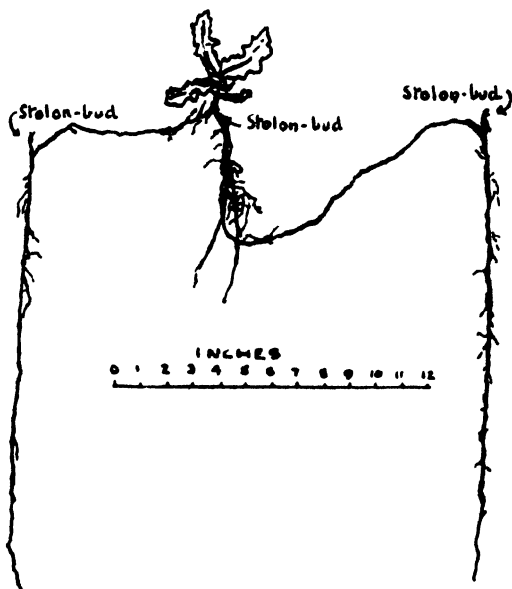


FIG 2.

A bud is indicated in the photograph. Fig. 2 is from a photograph of a young plant 150 days old. It is from the same sample of seeds as the plant shown in Fig. 1, and was also planted out at the same time. It shows the very rapid growth made by a seedling and indicates that even if, in the autumn, the young

plant and adjacent parts of the root system had been completely destroyed, there would be left two buds with attached roots possibly capable of developing in the spring.

The extensive underground system of a mature creeping thistle, with several stems in various stages of development above ground, make it possible to realize why cutting once, or even twice, a year should not exterminate every portion of it. The odds are very heavy in favour of some portion of this extensive growth being able to continue growing.

Farmers have often stated that the most effective way of exterminating the thistle from a pasture field is to leave the field for hay once or twice. Various explanations are offered. The most general gives the credit to the mowing machine, which ensures that both large and small thistles are cut. Against this, it must be stated that when the mowing machine is used in this way for thistle cutting on pastures very little benefit is seen. Another explanation is that the thistles get no opportunity of seeding in a hay field, the plants being cut and carted off with the hay, whereas in pastures the plants that are cut when in flower often seed when lying on the ground. Little importance, however, can be attached to the fact of the thistles being carted off the land with the hay crop, since they are too immature at this time to be able to form seeds.

It is here suggested that the true explanation of the almost complete disappearance of this weed when a field is left for hay for one or two years is to be found in the effect of the hay crop on the habit of growth of the thistle and the subsequent cutting with the mowing machine. In a crop of hay the thistle grows taller than in pasture, with leaves further apart on the stem, and with the lowest leaf at a much greater distance from the ground. The result is that, when the hay is cut, the portions of the thistles remaining in the ground are left without leaves. When thistles are cut in pastures, on the other hand, even with a mowing machine, some leafage is usually left attached to the "stump," thus enabling the plant to grow without falling back on its reserve food. In pasture, the leaves grow closely together, and the first leaf is almost always too near the ground to enable it to be cut away either with a mowing machine or with a scythe. It is also possible that the long spindly growth of the thistle in the hay crop weakens the plant; this, together with cutting so low that the "stumps" are left without leaves, may explain the well-known fact that infestations of Creeping Thistle practically disappear when a field is mown for hay two or three years in succession.

Two Creeping Thistle plants, representative of those grown in two adjacent plots, were examined. One, a short thistle, came from a grass plot that had been kept bare throughout the season by plucking off the grass with finger and thumb; while the other, a tall one, came from a plot where the grass had been allowed to grow for hay. The thistles in both plots were cut on July 15, 1931, at a height of $1\frac{1}{2}$ in. from the ground.

The thistle from the bare portion had leaves that were close together and extended down the whole length of the stem. All the thistle stumps on the "closely-grazed" plot had from 1 to 3 green leaves left after cutting. In the thistle from the hay plot the lowest leaf was at some distance from the point at which the plant was cut, and although all the plants in this plot were cut at the same height from the ground as those in the "closely-grazed" plot, not a single green leaf was left on the thistle stumps. The three lowest leaves in the tall thistle were withered and dead, and the lowest *green* leaf was some distance above the lowest leaf.

Table II shows (a) the total height of the thistles and (b) the distance from the cutting point to the first green leaf in the case of several representative plants in the "closely-grazed" and in the hay plot —

TABLE II

<i>" Closely-grazed " Plot</i>		<i>Hay Portion</i>	
(a) Total height	(b) Length from cutting point to first green leaf	(a) Total height	(b) Length from cutting point to first green leaf
Ft. In.		Ft. In.	Ft. In.
7	In all cases green leaves immediately above and below the cutting point	1 $7\frac{1}{2}$	9 $\frac{1}{2}$
10		1 $8\frac{1}{2}$	6 $\frac{1}{2}$
1 0		2 0	8
1 1		1 $5\frac{1}{2}$	8 $\frac{1}{2}$
11 $\frac{1}{2}$		1 10	6 $\frac{1}{2}$
1 2 $\frac{1}{2}$		1 11	6
5		1 8	4
1 4		2 1	6
8		1 4 $\frac{1}{2}$	8 $\frac{1}{2}$
3		2 11	1 1
9 $\frac{1}{2}$		2 0	10 $\frac{1}{2}$
11		1 6	8 $\frac{1}{2}$
		2 $5\frac{1}{2}$	10 $\frac{1}{2}$
		2 0	11
		2 5	11
Mean length 0 10 $\frac{1}{2}$			
	Mean ..	1 11	0 8 $\frac{1}{2}$

Thus, in the "closely-grazed" portion, the thistles averaged $10\frac{1}{2}$ in. in height (from cutting point) and the leaves extended practically down to ground level. In the hay plot the thistles averaged 1 ft. 11 in. in height (from cutting point) and the first *green* leaf was on the average $8\frac{1}{2}$ in. above the point at which the thistles were cut.

Further experiments are needed to determine whether cutting thistles in pastures with a mowing machine can be made more effective by allowing the grass to grow a little before cutting and thus encourage the elongated habit of growth.

Summary.—(i) Samples of seeds taken from heads of the Creeping Thistle had a germination capacity varying from 0 to 50 per cent., the average germination of 924 seeds being 12.6 per cent. This shows that the general belief that Creeping Thistles seed does not germinate is wrong. Even though the average germination of 12.6 per cent. may appear low, the total number of germinating seeds from a small colony may be enormous. This points clearly to the great importance of preventing flowering in the field, and the need for clearing thistles from hedgerows, roadsides, etc.

(ii) The growth made by a seedling is very rapid, and in four or five months the young plant may be in a position, by means of extensive underground development, to continue growing even if the above-ground portion of the plant with the adjoining roots is completely removed.

(iii) The habit of growth of the Creeping Thistle when growing in hay is rather different from that when growing in pasture. The plants are taller, the leaves are further apart, and the lowest *green* leaf is at such a height from the ground that, when the crop of hay is cut, it is only very rarely that a green leaf is left on the thistle stump. This is believed to be the chief reason why infestations of this weed are considerably reduced when a field is mown for hay.

VALUE OF GRASS SILAGE TO A SMALL HOLDER

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A TRIAL was carried out, in 1930, on the small holding of Mr. F. Gray, Rowan Farm, Tadley, Basingstoke, to determine the value of grass silage made at a time when there was more grass than was needed for grazing and when weather conditions prevented the making of hay. Mr. Gray farms 18 acres of grass land on which he keeps 10 milk cows, 1 bull, a few calves and pigs. The holding comprises 8 small fields varying in size from $1\frac{1}{4}$ to $4\frac{1}{4}$ acres and is run on intensive lines, rotational grazing being practised.

It was apparent about mid-September that, although none of the fields carried a heavy crop, grass was generally plentiful and more than would be required for grazing. Inclement weather conditions prevailed and no thought of hay-making could be entertained. It was decided to mow the grass on fields totalling $11\frac{1}{2}$ acres and make it into silage in a round stack. The stack was built in the paddock nearest to the buildings so as to be handy for feeding during the winter months. It was estimated that there would be from 20 to 25 tons of green material and the stack was built on a 12 ft. diameter, which increased to about 13 ft. during building. The stack was without foundation, and throughout its building the grass was cut in the morning and led in the afternoon, a boy doing the raking up.

Building the Stack.—Details of the building of the stack of silage are as follows: Cutting began on September 22, 1930, and continued until September 30 in showery weather. Stacking was completed on October 2. The crop was mostly very light. After the first day, each day's work raised the stack from about 5 ft., to which it had settled during the night, to 6 or 7 ft. The temperature was noted daily by means of a thermometer suspended in a length of gas piping driven vertically into the stack. For the first three days, the temperature did not exceed 82° F. and trampling was, therefore, reduced. On the fourth day, the temperature rose to 120° F. and stood between 90° and 125° F. during and after completion. On windy days, the stack was sheltered by sacking on the windward side. To avoid unevenness of pressure, carts were unloaded at different points of the circumference. The stack was

kept tightly pulled throughout, the material pulled out being thrown on the top; and the top was kept as level as possible. When completed, the stack was weighted with hedge trimmings and old timber. Bags of earth round the upper edge would probably have been more successful.

On October 12, the height of the stack was $5\frac{1}{2}$ to 6 ft. and the temperature, 18 in. from the top, was 118° F. The stack was built in layers which did not exceed 5 ft. at one filling and a day was allowed to elapse before the next layer was added, so that the temperature of the layer might reach the desired level of 100 – 120° F.

Quality of the Silage.—As the feeding experiments showed, the silage produced proved extremely valuable for the cattle on the holding. Fourteen tons of good silage were made and comprised the produce of $11\frac{1}{2}$ acres of grass that would have otherwise remained largely or entirely unused.

The nutritive value of the silage was tested at Jealott's Hill by means of a digestibility trial. A trial with two sheep showed satisfactory results although—as was to be expected from the fact that the herbage was poor—the composition of the silage was not very good.

COMPOSITION, DIGESTIBILITY, DIGESTIBLE NUTRIENTS AND STARCH EQUIVALENT OF GRASS SILAGE (ON BASIS OF DRY MATTER).

	Composition	Digestibility	Digestible nutrients	
	Per cent.	Per cent.	Per cent.	
Fat	3.02	55.0	1.66	Starch equivalent of Dry Matter = 44.8 per cent. (on original silage = 8.81 per cent.)
Protein	10.80	46.4	5.01	
True Protein ..	8.07	28.4	2.29	
Fibre	30.09	74.1	22.29	
Carbohydrates	43.71	62.7	27.40	
Ash	12.38	—	—	
Moisture ..	80.32	—	—	.

The digestible nutrients and starch equivalent values compare favourably with those reported for other samples of grass silage.

Feeding of the Silage.—The stack was first cut into for use six weeks after its completion. The material was a good "fruity" silage of a yellow-green colour. There were not more than 3 in.

of waste on the top of the stack and about 6 in. round the outside. The height of the stack was from 5 ft. 9 in. to 6 ft.

The first attempt to feed the silage was then made. It was offered to the cows after milking. The cows would not eat it, but, at the end of November, the silage was fed in the fields in the afternoon as the cows were coming in to the afternoon milking. The cows ate the silage when given in this manner and the amount fed was gradually increased. In mid-December, about 30 lb. per head were given, and this was increased to 40–45 lb. by mid-January, 1931. The cows were then eating the silage with relish. This ration, together with 4 to 5 lb. of hay and a balanced dairy ration for milk production, was continued until the beginning of March, 1931, when all the silage was finished.

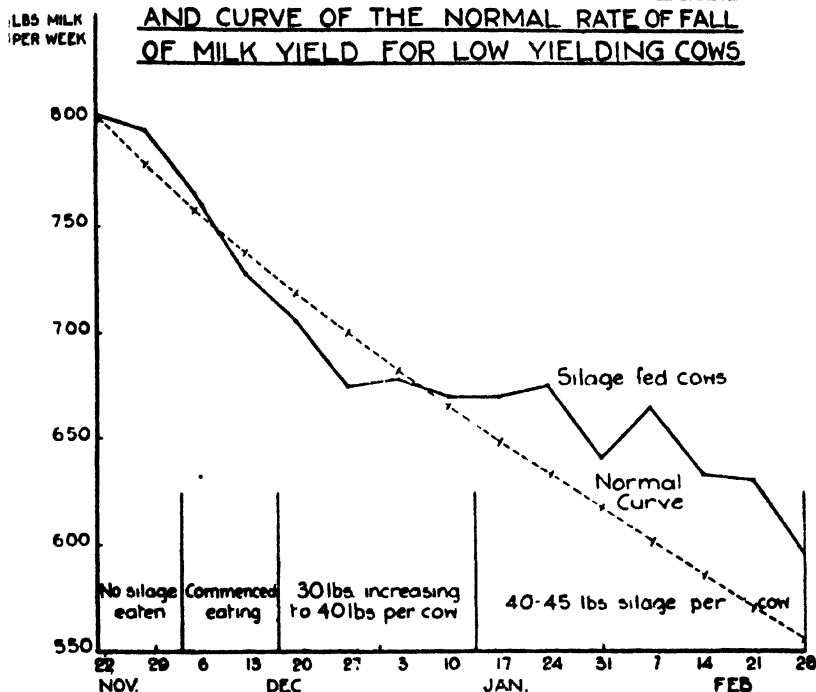
Six cows were in milk throughout the period during which the silage was fed. These were not heavy milkers, the daily yield of the six cows at the end of November being about 11½ gallons. In the accompanying illustration the milk yield of the cows is plotted together with a curve showing the average rate of the fall in milk yield of low-yielding cows.* It will be seen that the rate of fall during December was greater in the case of the cows receiving silage. As the amount of silage fed was increased, however, at the end of December and the beginning of January, the cows held up their milk yield very well. The curves show that the rate of fall, from the end of December until the end of February, was much less than the average, in spite of the fact that three cows were drying off. The silage had obviously improved the milk yield during the time it was being fed at the rate of 40–45 lb. per cow per day.

The silage was also included in the rations of young stock and the bull with excellent results. The effect on the bull was most marked. Late in the previous autumn he went off his feed and early in November looked poor and in bad coat. As he got used to the silage, his appetite and general vitality improved and within two months he was full of bloom.

Cost of Producing the Silage.—The total cost of the building of the stack was £9 10s. 10d. This figure includes all labour costs and the cost of hiring a horse and mowing machine. The bulk of the other labour, in addition to the smallholder and his boy, was provided by a neighbour and his boy free of cost in return for past help. This mutual exchange of labour often takes place in neighbouring small holdings. For the purpose of

* Sanders, *Jour. Agric. Sci.*, 1927, 17, gives values for the mean weekly drop in milk yield during the different months for high- and low-yielding cows. The curve is based on these figures.

GRAPH SHOWING CURVE OF
MILK YIELD OF COWS RECEIVING SILAGE
AND CURVE OF THE NORMAL RATE OF FALL
OF MILK YIELD FOR LOW YIELDING COWS



costing, however, the time spent by all hands has been included at the rate of pay of 8d. per hour for a man and 5d. an hour for a boy.

Space does not allow the discussion here of the costs as assessed by the conventional methods; it suffices to say that the silage was made largely from grass by the holder's labour, which would otherwise have been wasted. Taking the total cost of £9 10s. 10d. for labour for the silage, 14 tons, the cost of one ton of silage was 13s. 8d.

If the cost of the silage is calculated on a basis of a 15 per cent. moisture content, for the purpose of comparison with meadow hay, a figure of £2 18s. 1d. is obtained.

The main facts are, the smallholder was faced with a surplus of grass at a time when it was impossible to graze it or make it into hay. With a small outlay for the hire of a horse and mowing machine, he cut the grass for silage. Almost the whole of the labour used in the making of the stack was supplied by the holder and his boy with the help of a neighbour. This work did not take them away from the productive work of the holding. The result was that he produced 14 tons of good silage, which was fed to dairy cows with beneficial effect on their

milk yield and effected a considerable saving of hay. The silage on an equivalent dry matter content was equal to about $3\frac{1}{2}$ tons of very good meadow hay.

Summary.—It is possible to make grass silage of high feeding value from grass in autumn when hay-making is out of the question. Such silage has been made on a smallholding at a low cost. The grass silage was made in a stack and was shown to have a high digestibility. It was given to dairy stock at the rate of 40–45 lb. per day, with beneficial effect on milk yield.

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COURSES IN APPLE PACKING

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MODERN transport brings well-packed produce to our markets from the ends of the earth. Distant countries that compete in our markets have to ensure that their produce arrives in good condition. They have had to discover suitable methods of packing and the most economical way to carry them out. The proper packing of produce, especially of fruit, entails the employment of speedy and highly skilled labour.

Canadian Experience.—For some years past fruit growers in Canada have felt the need of trained girls. To meet this, training schemes in packing and grading have been arranged either jointly by the Federal Government, the Provincial Government and the local Packing House, or by a big Co-operative Packing House. Such courses extend for one week, and the instruction is given by the manager of the packing house.

Another type of course is arranged for the managers of the packing stations. It is organized by the Dominion Government Inspectors at a suitable centre with the object of standardizing the instruction to be given later by the managers. Thus the packing stations can rely on getting trained girls. Incidentally, such girls are paid higher rates and have every incentive to become more skilled, as greater skill means more money.

Training in Kent.—Inquiries in Kent made by the writers and other officers of the Ministry seemed to offer some prospects of success for a training scheme conducted on lines similar to those already mentioned.

A preliminary scheme drawn up in consultation with the growers and the Horticultural Instructor of the Kent Farm Institute was discussed at the Fruit and Vegetable Sub-Committee of the Kent Branch of the National Farmers' Union,

and after some modification was recommended to the County Education Authority. Briefly the scheme was as follows :—

- (i) The instruction should be given at a packing house or shed in any suitable country district and be open to all women in the district.
- (ii) A suitable teacher would be a woman with the following qualifications :—
 - (a) education, personality, and rural experience.
 - (b) horticultural or agricultural training and experience ;
 - (c) specialized training in packing and grading.

With regard to the future teacher or demonstrator, it was thought that the qualifications referred to could probably be found in a woman who had received training in one or other of the horticultural or agricultural colleges. It might be possible to find a woman so trained who had gained further experience of countrywomen by working in country districts. She would, however, also require a specialized training in packing and grading.

The Kent Farm Institute.—The Local Education Authority decided to run a trial course in grading and packing at their Farm Institute at Borden. This Institute occupies the buildings of the old Borden Grammar School, and is situate in a fruit-growing area. The buildings are pleasantly constructed and overlook undulating orchard land and the town of Sittingbourne. The farm extends to 250 acres, of which about 80 acres are orchards, and these supplied the fruit for the course.

Packing Course for Women.—This course lasted 10 days, and the fees amounted to 10s. 6d. (tuition) and 19s. 6d. (board) to residents in the county, or £1 1s. (tuition) and £1 19s. (board) to others. Work commenced each day at 8.45 a.m., and terminated at 5.0 p.m., with an interval of 1½ hours for dinner.

The large lecture room and a small common room were used for the course. In the former an Ideal mechanical grader (lent by the Ministry) was installed, and in the smaller room there was a hand-grader suitable for a small fruit holding. The students stood round the graders and handled and packed the fruits as described later. In all, 17 students attended, including two past students of Swanley Horticultural College, two women Inspectors of the Ministry, the assistant secretary for a local branch of the Kent Farmers' Union, the daughters of three fruit growers, the wife of the bailiff of a local fruit grower, two women employed by a grower near Maidstone, and six others employed by various growers—two coming daily from Canterbury. All the working women had their fees, travelling expenses and wages paid by their employers.

Newton Wonder and Bramley Seedlings were graded as gathered from the orchards, in all sizes and conditions.

The instruction was given by Mr. Hart (Horticultural Instructor at Borden) assisted from time to time by officers of the Ministry.

Students took their turns at :—

- (a) Wrapping. Not an easy operation, a whole day being required to learn the correct method.
- (b) Grading.
- (c) Box-packing fancy grade fruit.
- (d) Packing fruit in sieves and barrels.
- (e) Packing in trays, including making up pads.
- (f) Making boxes, nailing on lids, and affixing labels.
- (g) Grading by the hand grader.

The apples were sorted stage by stage into grades, divided into sizes, wrapped, packed, labelled and sent to the market in a normal commercial manner. Every student realized that these operations were precisely those that would be done on fruit growers' premises.

Day by day the packers increased their knowledge of packing, and acquired more confidence and greater speed in performing the various operations.

As an additional feature, the Ministry arranged a marketing exhibit at the Institute to show the students how other fruit should be packed and the types of package now becoming popular.

In addition, the Ministry arranged for an expert woman packer, Mrs. Delves, to visit the Institute, to give a demonstration in packing apples at high speed. A box of apples was packed in three minutes. This demonstration, naturally, encouraged all the students to try themselves to reach this high standard of skill.

Growers' Visit.—In response to an invitation from the Principal of the Institute, fruit growers in Kent, representatives of the Press, and others took the opportunity to visit the centre and see the course in operation. The visit, no doubt, impressed them with the need for employing trained people for this skilled work.

Further Training at Growers' Packing Sheds.—Subsequently, the two former Swanley students and the Ministry's two women Inspectors who had taken the Institute course were able, by the kindness of two fruit growers, Messrs. T. Neame and H. Edmonds, to gain further experience in packing fruit on a commercial scale. It was found that nothing learned at Borden had to be unlearned in a grower's shed. On the contrary, the course at the Farm Institute proved a useful

foundation on which to build up the greater speed and wider experience necessary for commercial packing. The expert women employed by these growers did all they could to enhance the usefulness of this further training.

Future Developments.—The small beginning outlined above—the first of its kind in the country—opens up great possibilities. It has had an immediate development in a similar course for fruit foremen at Borden.

The possible effect, on the rural population, of available instruction in a skilled occupation can only be estimated, but the following results are probable :—

- (i) The more skilled worker could ask (and, growers declared, would obtain) better wages.
- (ii) A large proportion of women living in the country cannot undertake whole-time employment, but welcome employment that is part-time, and particularly during the summer months. Training would help them to obtain this.
- (iii) The drift of young women to town occupations would be checked to a certain extent by adding a skilled and remunerative agricultural occupation to that already available in domestic and farm work.
- (iv) Every extra member of a family having a direct earning interest in country industry means an additional reason for the family to stay in the country.
- (v) Every extra earning member of the family raises the standard of living of the family.

Course for Fruit Foremen.—The immediate result of holding the packing course for women was to create a demand from the farmers themselves for a similar course for their fruitmen—a development of far-reaching importance. It may be mentioned that the residential facilities at the Institute did not permit of a mixed course being held.

Profiting by the experience gained in the previous course, certain modifications were made :—

- (i) The length of the course was reduced to one week, because it was found that by the end of a week nothing but practice was required to enable the packers to gain speed, and this could better be obtained under commercial packing-house conditions.
- (ii) The number of students was limited to 10, as it appeared that this was the maximum number that could be supervised satisfactorily by two instructors, especially during the first two or three days.
- (iii) Special attention was paid to certain points, on which students at the first course showed particular weakness—the absolute necessity of careful and consistent grading; the correct method of determining the pack to be used; and the need for adjusting the pack to a regular net weight.
- (iv) It was found better to teach one operation at a time to all students, than to have all operations proceeding together from the beginning.

The chief difficulty in conducting courses of this kind lies in providing sufficient apples of suitable quality. It is now thought that not fewer than 50 bushels of high-grade apples are required for each student. A smaller quantity means frequent repacking, which causes a heavy loss in value of the fruit. Two varieties should be used—one, such as Newton Wonder, which is easy to pack, and one, such as Bramley Seedling, which is more difficult. The need for high-grade fruit must also be recognized, because students made very little progress in box packing when set to pack grades unsuitable for boxing.

Of the 10 students who were accepted, 1 was a farm pupil, who paid his own expenses, and the other 9, all of whose expenses were paid by their employers, consisted of 3 farm bailiffs and 6 fruit foremen or leading fruit hands.

Owing to the difficulties of starting the first course and the publicity which it received, as being the first, there is a danger that the very great advance represented by this second course will be overlooked. While the employed workpeople who took the first course could be released from the farms without special difficulty, practically all the men attending the second course were highly skilled men, whose absence from work must have created considerable difficulties on the farms. The fact that nine farmers were willing to spare them and pay all expenses, including their wages, speaks volumes for the manner in which they now regard the need for standardized methods of grading and packing.

A word in praise of the attitude of the men themselves should also be given. Although they had all been closely connected with fruit all their lives, there was not the remotest hint from any of them that they had nothing more to learn. All were keenly alive to the need for keeping abreast of the times, and young and middle-aged alike were determined to get the last ounce of value out of the course. It happened that a lecture on one aspect of the production of fruit was given on one of the evenings during the course. All attended this and discussed the subject keenly.

The effect of these courses will extend far beyond grading and packing. It is not until fruit is graded to a definite standard that the grower appreciates the high proportion of low-grade fruit which he produces. Employees, when they go back to the farms, are going to realize more than ever before the need for improvements in production, and will be active co-operators in the attempt to grow better fruit.

FOOT-AND-MOUTH DISEASE

IMPORTATION OF MEAT, ETC. (WRAPPING MATERIALS),

ORDER OF 1932

THE Ministry has ascertained that it is the practice at the present time to use the cloth in which meat has been wrapped when imported into this country from abroad for the purpose of manufacture into bags in which foodstuffs for animals, fertilizers and horticultural produce are packed and distributed. Many millions of these imported meat wrappers are used annually for that purpose. The Ministry is advised that in the event of the meat so wrapped being that of an animal which was affected with foot-and-mouth disease, it is possible for the infection to be retained by the wrapper after being made into bags and for the disease to be conveyed by this means to the farm where the bag is delivered. The waste from horticultural produce often finds its way to the swill tub and if infected by the bags will be the means of infecting animals. In these circumstances the Minister of Agriculture and Fisheries considers it necessary that steps should be taken to prevent the use of meat wrappers for the making of bags that will be used for containing any of the above-mentioned products and thus to eliminate this possible channel through which the infection of foot-and-mouth disease may be brought into contact with farm animals in Great Britain.

With this object in view the Minister has made an Order entitled "The Importation of Meat, etc. (Wrapping Materials), Order of 1932." The Order contains four main provisions, namely:—

(1) The Order prohibits the landing in Great Britain from a "prohibited country" of meat and offals if packed or wrapped in any cloth, bag, sacking or like material not being bags or wrappers wholly made of:—

- (a) Jute, hemp, flax, or other cloth manufactured with three red threads woven together at intervals of 12 inches in the warp;
or
- (b) Stockinette; or
- (c) Paper.

A "prohibited country" means any country outside Great Britain except Northern Ireland, the Irish Free State, Channel Islands, Isle of Man, Australia, New Zealand, Canada, Union of South Africa (including the Mandated Territory of South-West Africa), the United States, Iceland and the Farøe Islands.

It will be understood that neither stockinette nor paper is suitable for the making of bags, and the object of prescribing a particular pattern of cloth to be used for wrapping imported meat is to ensure that it shall be readily recognisable in all the trades concerned in the packing and distribution of feeding stuffs for animals, fertilizers, and horticultural produce, in view of the further provisions of the Order mentioned below.

(2) The Order prohibits the landing in Great Britain of any feeding stuffs for animals, fertilizers, or any horticultural produce packed in bags, sacks, or other receptacles wholly or partly made from any of the red striped material referred to in (a) of the preceding paragraph, or in bags or other receptacles in the manufacture of which meat wrappers of any material whatsoever have been used.

(3) The Order renders it unlawful :—

(a) to pack in Great Britain ;

(b) to carry by railway, water, road or air in Great Britain ; or

(c) to sell or offer for sale in Great Britain,

any feeding stuffs for animals, or any material intended for use as bedding for animals (including straw, sawdust, peat-moss, or other litter), or any fertilizer or horticultural produce, in any sack or receptacle wholly or partly made from the red striped material referred to in the above paragraph 1 (a).

(4) The Order also prohibits the feeding to animals, or the use as bedding for animals, of any such feeding-stuffs or materials which have been packed or contained in any such sack or receptacle, that is wholly or partly made from the red striped material referred to in the above paragraph 1 (a).

For the above purposes, the terms used in the Order have the following meanings :—

“ *Animals* ” includes cattle, sheep, pigs, goats, horses, asses, mules, fowls, turkeys, geese, ducks, guinea-fowls and pigeons.

“ *Feeding-stuffs for animals* ” means any feeding stuffs, including wheat, barley, oats, maize and other grains, beans, peas, dals, millers’ offals, meals, oilcakes, brewers’ grains, dried sugar-beet pulp and chaff, intended for feeding to animals or capable of conversion after importation into Great Britain into food for feeding to animals.

“ *Fertilizers* ” means any article used as a fertilizer of the soil and includes basic slag, compound fertilizers, fish guano and fish manure, animal by-products containing bones, hoofs, horns, or blood, lime and lime products, potassium salts, nitrate of soda, raw phosphate or phosphate rock (ground or otherwise), sulphate of ammonia and superphosphate.

“ *Horticultural produce* ” means any plant, fruit or vegetable, and the seeds, tubers, bulbs or other parts of a plant.

“ *Meat* ” and “ *Offals* ” mean the meat and offals derived from any carcass of cattle, sheep or swine and includes bacon and ham.

“ *Meat Wrapper* ” means any cloth, bag, sack, sacking, hessian wrapper, or material which has been used for or in connexion with the wrapping of meat, meat products, offals or other parts of the carcass of an animal.

Any person who does any act in contravention of the Order, or aids, abets, counsels or procures the commission of any breach of the Order, is liable to the heavy penalties provided by the Diseases of Animals Act.

The Order comes into full operation on November 1, 1932.

It should be noted that the Order does not in any way interfere with the provisions of the Importation of Carcasses (Prohibition) Order of 1926, or its amending Orders, which *inter alia* prohibit the importation of fresh carcasses from Europe.

The object of the new Order, as already indicated, is to reduce the risk of the introduction and spread of foot-and-mouth disease, outbreaks of which not only involve the Government in expense, but also cause heavy losses to farmers and others connected with the agricultural industry. It is, therefore, incumbent upon all who are engaged in the importation of meat or in the importation, packing and distribution of feeding-stuffs, fertilizers and horticultural produce to co-operate with the Ministry to ensure that the provisions of the new Order are strictly observed.

* * * * *

MARKETING NOTES

National Mark Eggs.—Satisfactory progress continues to be made by the National Mark Egg Scheme and the authorized packing stations are steadily increasing their output. During the first four months of this year, 140 stations operating in the Scheme handled 147·1 million eggs, of which 119·4 million were packed under National Mark labels, the latter figure representing an increase of 45 per cent. over the comparable figure for the corresponding period of 1931.

The following six packing stations had the largest National Mark output last year :—

Wiltshire Egg Producers, Ltd.

Norfolk Egg Producers, Ltd.

Chelmsford Egg Supply Co., Ltd.

Gloucestershire Marketing Society, Ltd.

Melton Mowbray and District Farmers' Association, Ltd.

Dorset Egg Producers.

The leading position which producer-controlled stations have attained is of interest. Progress is not, however, confined to the large stations. For example, a station that commenced operations in 1929 with the bare minimum throughput permitted by the scheme has steadily advanced until its turnover has increased tenfold.

A number of inquiries regarding the establishment of packing stations have been received recently from (a) poultry and kindred societies who are examining the possibility of operating on co-operative lines, and (b) wholesale egg merchants who have hitherto dealt mainly in imported supplies. It is evident that producers are becoming increasingly alive to the importance of collective action, while at the same time the

interest shown by wholesale distributors reveals the importance now attached to the National Mark egg by large business interests. In the light of these developments, an opportune step has been taken in the appointment to the Board of National Mark Egg Central, Ltd., of Mr. Ernest T. Thornton-Smith as the nominee of the Minister of Agriculture. Mr. Thornton-Smith's business experience will be a valuable asset to the Society in developing a progressive sales policy.

National Mark Dressed Poultry.—From recent reports, authorized packers generally are well satisfied with the results of marketing their produce under the National Mark. One packer has stated that, among other advantages of the scheme, he finds that his consignments are certain of a ready sale.

London retailers show a keen desire to obtain supplies of National Mark dressed poultry. For example, the branch manager of a large firm has asked his head depot to send him none other than National Mark poultry.

Earl De La Warr, Parliamentary Secretary to the Ministry, opened, on April 30, the new packing station of Shenley Poultry Products, Ltd., at Oldlands Farm, Balcombe, Sussex. In his speech, he stated that the station was an instance of the national movement for perfecting the production and marketing of table poultry, and the efforts now being made by the producers themselves to build up a prosperous agricultural industry were most encouraging to the Government. Poultry consumption per head of the population was comparatively low in this country, and, on this account alone, there was a big potential demand to be developed, apart from the displacement of imported supplies. Whilst good progress had been made in efficiency of production, reform was greatly needed in the region of marketing. It was by reason of good presentation, careful grading, standard packages, and regular and uniform supplies, rather than by superior quality, that imported chicken at present enjoyed a high reputation on our market. The National Mark Scheme for table poultry had been introduced to provide for standardization on a national basis and to enable the home product to compete successfully with imported supplies. With greater and more effective support of the scheme, a basis would be provided for the setting up of some large-scale organization of poultry producers for marketing purposes. It was only by organization that adequate and regular supplies could be maintained.

Four fresh authorizations have recently been granted, and the roll of packers now stands as follows :—

<i>County</i>	<i>Address</i>	<i>Registered No.</i>
<i>Bucks</i>	Bowman-Shaw & Grundy, Archers, Chalfont St. Giles.	13
	Mid-Bucks Poultry Packers Co., Aston Clinton, Aylesbury.	14
<i>Gloucester</i>	Alexander & Angell, Cranham Corner, Cranham.	6
<i>Hants</i>	Goatacre Poultry Farm, Ltd., Medstead.	7
	E. N. Kemsley, Upton Manor, near Andover.	10
<i>Kent</i>	Shenley Farms, Shenley, Headcorn.	8
<i>Norfolk</i>	*G. James, Green Farm, Bunwell, Norwich.	12
	H. P. E. Neave, Catfield.	15
<i>Northants</i>	Kettering Poultry Packers, Hill Cottage Poultry Farm, Islip, Kettering.	9
<i>Somerset</i>	Somerset Egg & Poultry Co., Ltd., Leycroft Road, Taunton.	243
<i>Suffolk</i>	Goldsmith Bros., Ltd., Northgate Street, Bury St. Edmunds.	246
<i>Sussex</i>	O. A. Batten, Cralle Place, Vines Cross.	16
	Vivian Giddins, West Hill Place, Balcombe.	11
	Shenley Poultry Products, Ltd., Oldlands Farm, Balcombe	1

* Ducks only.

National Mark Scheme for Plums.—At a meeting of the Council of the Retail Fruiterers' and Florists' Association, which was held on April 20, the following resolution was passed unanimously :—

"That this organization, having examined the proposed National Mark scheme for home-grown plums, records its pleasure at this further step towards the standardization of home-grown produce, and pledges its full support to the scheme when it comes into operation."

Details of the scheme are included at p. 247 of this issue of the JOURNAL.

Publicity for National Mark Products.—Concurrently with the Ministry's display of National Mark products at the Nottingham Grocers' and Allied Trades Exhibition, May 11-21,

a National Mark "Shopping Week" was held in Nottingham, the principal feature being a shop-window display competition open to retailers who stock National Mark products, and for which the Ministry offered cash prizes. Advertisements were inserted in local newspapers, and posters were displayed in the Corporation trams.

The need for economy in national expenditure has led to a substantial reduction of the funds available for publicity purposes during the current financial year ending March 31, 1933. It has, therefore, been necessary to give careful consideration to the programme for the year so as to allocate the funds available to the best possible advantage. The following paragraphs indicate in broad outline the various items of publicity that the Ministry proposes to undertake.

- (1) *National Mark Shopping Weeks*.—In addition to the "Week" at Nottingham, May 11-21, National Mark Shopping Weeks have been arranged in association with displays of National Mark products as follows:—

<i>Town</i>	<i>Date</i>	<i>Concurrent event</i>
Guildford	May 30-June 4 ..	Royal Counties Agricultural Show, June 1-4
Eastbourne	June 20-25 ..	Sussex Agricultural Show, June 22-23
Leeds	July 11-16 ..	Great Yorkshire Agricultural Show, July 12-14
Preston	July 25-30 ..	Royal Lancs. Agricultural Show, July 28-August 1
Rochdale	September 14-24	Rochdale Chamber of Trade Exhibition, September 14-24

It is hoped to arrange a National Mark Shopping Week at Swansea (October 11-20) in association with a display of National Mark products at the South Wales Grocers' Exhibition, and also at two other towns in the autumn or winter.

- (2) *Empire Marketing Board Advertising Frames*.—Arrangements have been made to lease the Empire Marketing Board's advertising frames for two periods of three weeks, namely, in September throughout England and Wales, and in February, 1933, in the principal urban areas of the country.
- (3) *Display Material and Leaflets*.—Shop display material and leaflets provide a useful means of familiarizing the general public with the National Mark and the products sold under it. This service will be continued.
- (4) *Press Advertising*.—Restriction in funds will necessitate a substantial reduction in Press advertising, but it is intended to advertise individual products in trade papers, to continue the advertisements of National Mark beef in the Birmingham, Leeds, Bradford, and Halifax newspapers for a further period, and to carry out supporting Press publicity for National Mark Weeks in newspapers circulating in the areas concerned.

- (5) *Films*.—The Ministry's marketing films will be shown at agricultural shows at which marketing demonstrations are being given, and in cinemas and elsewhere as opportunity offers. A tour is also being planned for the summer months for a travelling film van. Arrangements are in hand for the preparation of a number of new films, and for the conversion of certain existing silent films into "talkies" by the addition of suitable running commentaries.
- (6) *London Underground Trains*.—It will be recalled that, in the last two years, the sides of London omnibuses have been used for advertising National Mark products. This year, the use of a number of advertising spaces in London Underground trains is under consideration.
- (7) *Head-rest Advertisements in Trains*.—Particulars of the contract arranged for head-rest advertising in L.M.S. trains were given in the May issue of this JOURNAL.
- (8) *Lectures to Women's Institutes*.—Arrangements have again been made for lectures on the National Mark to be given to women's institutes and other women's organizations by lecturers on the Empire Marketing Board's panel, and also by trained women speakers in the Birmingham and Leeds areas.
- (9) *Press Articles, etc.*—The Ministry is able to secure considerable publicity for National Mark schemes through the provision of notices and articles to the general, agricultural and trade Press, and also by means of material supplied for broadcasting. A new departure has been made this year by arranging for editorial publicity of the menu and cookery article type.
- (10) *Demonstration Van*.—In September, it is proposed to try an experimental tour of certain rural areas with a demonstration van from which samples of National Mark commodities will be sold.
- (11) *Young Grocers' Tour*.—In July, fifteen of the successful students in the examination of the Institute of Certified Grocers, accompanied by three teachers, are being taken by the Ministry on a six days' tour of selected agricultural centres, including various National Mark factories and packing stations. Similar tours were arranged in 1930 and 1931, and were very successful from the point of view of interesting future leaders of the grocery trade in good-quality home-grown foodstuffs. The Institute is defraying half the cost of the coming tour.

National Mark Booklet.—A third edition of the booklet, *The National Mark*, in which is included brief particulars of the National Mark schemes that are being introduced this year for plums, honey, and bottled fruits and vegetables, as well as information regarding existing National Mark schemes, has recently been issued. Copies may be obtained, free of charge, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1. The circulation of the second edition of the booklet, printed in July, 1930, reached 700,000 copies.

Use of Home Produce by Hotels and Restaurants.—Earl De La Warr, Parliamentary Secretary to the Ministry, presided on May 9 at the first meeting of the Committee of

representatives of leading hotels and other catering establishments, including railway and shipping companies, that is considering how the food requirements of this trade can be met from home sources. The Committee, to which Mr. A. Piper, General Manager of Messrs. Spiers & Pond, Ltd., has been appointed an additional member, considered detailed information that had been supplied by a number of the largest hotel groups and catering firms with regard to their purchases of fresh meat and canned fruits and vegetables; it is proposed that specific points shall be discussed later with meat producers and canners respectively. At their next meeting the Committee will confer with the National Mark Canned Fruit and Vegetable Trade Committee.

Marketing Demonstrations.—A display of National Mark fruit, canned fruit, and cider was given at the Long Ashton Research Station at Bristol on the occasion of the Station's tasting day on May 5.

Marketing demonstrations were staged at the following agricultural shows during May :—

Devon County Show, Tavistock (May 17-19).

(National Mark Hall; mutton; butter; organization of wool marketing.)

Bath and West Show, Yeovil (May 25-28).

(National Mark Hall; butter; organization of wool marketing.)

At the Bath and West Show, a special educational exhibit was also staged in the Ministry's Pavilion, dealing with various phases of agriculture, including animal physiology, poultry diseases, clean milk production, and sugar-beet.

The April issue of this JOURNAL contained a complete list of the Agricultural Shows at which demonstrations are to be given this season, together with a note of the nature of the exhibit at each show. The following notes give a brief description of the demonstrations, some of which are being given for the first time this year.

In the *National Mark Hall*, which is the main feature of these demonstrations, all the National Mark schemes are demonstrated by means of examples of the various commodities graded and packed to National Mark standards.

The Mutton and Lamb Demonstration illustrates graphically, and by a display of carcasses, the use of standards of quality and weight as a basis for the grading of mutton and lamb, leading up to a scheme for the application of the National Mark to these commodities. Certain exhibits demonstrate how the economic utilization of by-products is related to the efficient organization of slaughtering facilities.

The Demonstration of the Organization of Wool Marketing depicts wool-marketing methods at home and abroad, and suggests how producers can contribute to the improvement of the existing organization in this country.

The Demonstration of the Organization of Potato Marketing calls attention to the problems that arise in connexion with this subject and shows examples of methods adopted overseas, together with suggestions for improved organization in this country.

The Butter Demonstration illustrates the need for greater uniformity in the quality of home-produced butter and shows a suggested method for the application of the National Mark to this product. The methods of marking adopted by various overseas countries are also shown.

Displays of National Mark and Other Produce.—A striking testimony to the ability of home producers to grow early flowers and vegetables was seen in a display of home-grown market produce staged at the Royal Horticultural Hall, London, on April 26 and 27. The occasion was one of the Society's fortnightly shows, and a portion of the Hall was devoted to an exhibit of home-grown flowers and vegetables as packed for the market. In co-operation with the Society and the Ministry, the responsibility for the display was undertaken by the National Farmers' Union and various marketing associations. Besides a large variety of flowers, the exhibit comprised a display of excellent examples of early vegetables such as lettuce, beans, seakale, marrows, rhubarb, broccoli, cabbages, spinach, radishes, onions, leeks, and mushrooms. The skill of home producers was also amply demonstrated by the packages of exquisite strawberries, peaches, and grapes, all produced much in advance of their normal season, as well as by a display of Bramley Seedling apples, graded and packed under the National Mark, which had been kept in perfect condition in a modern gas-filled cold-store. An attractive exhibit of bottled and canned English fruits and vegetables bore testimony to the growing popularity of these products. In opening the exhibition, Lady Gilmour, who was accompanied by Sir John Gilmour, paid a tribute to the excellence of the exhibits and the skill of the producers.

National Mark products in season were displayed at the Nottingham Grocers' and Allied Trades Exhibition, May 11-21. On the adjoining stand, a demonstration of the grading and packing of eggs under the National Mark Scheme was given by Newark Egg Producers, Ltd.

At the Nation's Food Exhibition held at Olympia, London, from May 21 to June 4, the stand for England and Wales in the Empire Marketing Board section comprised a representative exhibit of home produce (including a number of National Mark commodities) arranged by the Ministry in conjunction with the National Farmers' Union, the Food Manufacturers' Federation, the National Fruit Canning Council, and other

bodies. In another part of the Hall a National Mark egg-grading demonstration was carried out by Messrs. Williamsons in conjunction with the Ministry. The Ministry also included an exhibit illustrating the objects and operation of the National Mark schemes.

Agricultural Marketing Act, 1931 : Reorganization Commissions for Milk and for Pigs and Pig Products.—*Milk.*—The Minister of Agriculture and Fisheries has constituted an Agricultural Marketing Reorganization Commission for Milk. The duty of this Commission is to prepare a scheme or schemes under the Agricultural Marketing Act, 1931, to be applicable in England and Wales for regulating the marketing of milk. The Minister has directed that the Commission in the course of preparing any such scheme shall :—

- (a) investigate the extent to which its operation could be facilitated by co-operation between the board administering it and any corresponding body in Scotland or Northern Ireland ;
- (b) investigate any other matter affecting its operation ; and
- (c) make recommendations with respect to the matters investigated.

The composition of the Commission is :—

Chairman : Sir Edward Grigg, K.C.M.G., K.C.V.O., D.S.O., M.C.

Members : Professor A. W. Ashby, M.A.

F. N. Blundell, Esq.

A. E. Cutforth, Esq., C.B.E.

Major-General Sir Philip Nash, K.C.M.G., C.B.

Pigs and Pig Products.—The Minister of Agriculture and Fisheries and the Secretary of State for Scotland have appointed an Agricultural Marketing Reorganization Commission for Pigs and Pig Products. The duty of this Commission is to prepare a scheme or schemes under the Agricultural Marketing Act, 1931, to be applicable in Great Britain for regulating the marketing of pigs and any pig products. It will be a direction that the Commission in the course of preparing any such scheme shall :—

- (a) investigate the extent to which its operation could be facilitated by co-operation between the board administering it and any corresponding body in Northern Ireland ;
- (b) investigate the manner in which its operation could be facilitated by the quantitative regulation of imports of pigs and bacon, and by similar or different measures affecting other pig products ;
- (c) investigate the manner in which such regulation could best be undertaken in the public interest ;
- (d) investigate any other matter affecting the operation of the scheme ; and
- (e) make recommendations with respect to the matters investigated.

The composition of the Commission is :—

Chairman : Colonel the Rt. Hon. G. R. Lane-Fox, D.L., J.P.

Members : Sir William Haldane, W.S.

H. G. Howitt, Esq., D.S.O., M.C.

Lieut.-Colonel Sir Wyndham Portal, Bart., M.V.O.,
D.S.O.

The Hon. Jasper Ridley.

General.—It has been left to the discretion of the Commissions to decide in what manner and to what extent they obtain expert advice from the interests concerned. As the inquiries of both Commissions proceed, evidence is being invited from the leading organizations that represent producers, distributors, manufacturers and consumers. The Commissions will be glad also to receive memoranda from any persons who wish to lay information or suggestions before them.

The Secretary to both Commissions is Mr. J. B. Baber, and the Assistant Secretary is Mr. A. R. Manktelow. All communications for either Commission should be addressed to the Secretary at 3 Sanctuary Buildings, Great Smith Street, Westminster, London, S.W.1.

Report on the Marketing of Dairy Produce: Part II, Butter and Cream.*—This latest addition to the Ministry's Orange Books deals with the marketing of butter and cream in England and Wales. Two previous reports in the series† have covered the marketing of liquid milk and cheese respectively.

The present Report is divided into two sections, the first concerned with butter, the second with cream.

The butter section of the Report commences with a survey of supplies, demand, and prices. Butter production utilizes only about one-seventh of all milk produced in Great Britain. Nine-tenths of the supplies consumed are imported; imports have risen tremendously during the past few years, concurrently with a heavy fall in world prices. The milk equivalent of all butter imported in recent years has been over 1,800 million gallons per annum. There is thus considerable scope for the exploitation of the butter market by the home dairy industry as a means of utilizing surplus milk.

The Report examines the suitability of the various types of butter manufacture on farms, in creameries, and in blending factories, for producing an article of high and uniform quality. The inevitable deficiencies of the farm butter industry in this respect, particularly from the standpoint of uniformity of product, are emphasized. The blending of farm-made butter

* Economic Series No. 30: H.M. Stationery Office, price 6d. net.

† Economic Series Nos. 16 and 22.

can produce a uniform product from the varied output of farms, but can do nothing to raise the general level of quality of the home product. The creamery industry alone is in a position to maintain a high and uniform standard of excellence in its output. It is, in fact, on the basis of a creamery industry that the big exporting countries have built up their trade. The measures that have been adopted in these countries to control the quality of their butter exports, as a basis for national brands and marks, are fully described.

Consideration of overseas methods provokes the question whether the machinery provided in the Agricultural Produce (Grading and Marking) Acts could not be used to secure standardization in the home industry. The conclusion is drawn that a National Mark Scheme for farm butter would not be of much commercial value ; the number of producing units is too great and the conditions of production too varied to enable the wide differences in quality between individual lots to be eliminated. For creamery butter, however, there seems to be no obstacle to the adoption of methods of standardization similar to those in other countries. The outline of a National Mark scheme for creamery butter is, therefore, put forward for consideration.

It is possible that before long the rationalization of milk marketing may lead to a considerable development in the creamery butter industry. The voluntary adoption of quality standards, together with the National Mark, at the present early stage would lay the foundation of a widespread demand for the home product in urban centres, and would prepare the way for the development of the industry along right lines.

The butter section of the Report concludes with a description of the prevailing methods of assembly and distribution, and of transport and storage of home-produced butter. A separate chapter is devoted to an outline of producer-organization for butter marketing purposes in other countries.

The cream section of the Report is arranged similarly to the butter section. A preliminary survey of supplies and demand shows a rapid increase in cream consumption and in imports of tinned cream in recent years. This indicates considerable scope for the expansion of demand. The recommendations that are made in this section of the Report are in fact aimed mainly at demand expansion.

Standardization is suggested as a means of establishing the confidence of the consumer in the home product. A suggested National Mark scheme is outlined that would

prescribe, for voluntary use, not only standards of quality—i.e., of fat content and freshness—but also standard units of sale and standard types of containers. A National Mark Scheme would enable the buyer definitely to distinguish the genuine home product. To meet the demand for cheaper forms of cream, grades are suggested for a “light” fresh cream of relatively low fat-content and for tinned sterilized cream. The latter product, besides its cheapness, has the advantage of keeping indefinitely. Though the canning of cream is not yet extensively practised in this country, a National Mark scheme should help to stimulate the demand and thus lead to an expansion of this outlet for “surplus” milk.

The difficulty that might arise in administering a National Mark scheme for fresh cream, owing to the very large number of retail dairymen engaged in packing cream for retail sale, leads to the suggestion that the industry itself, in the event of a plan emerging for rationalizing the marketing of milk in this country, should assume a large measure of responsibility for the control of grading and marking.

The Report is well illustrated.

Encouragement of Grain-Growing in Switzerland.—In view of the steps that have been taken under the Wheat Bill to secure an enhanced price to growers of wheat in the United Kingdom, particular interest attaches to a report recently presented by the Federal Council to the Federal Assembly in Switzerland, reviewing the Swiss system for the regulation of grain and the encouragement of home production. This system, which applies to a specified list of grains used for bread-making, bears some resemblance to the United Kingdom scheme for wheat in that it guarantees a fixed price to the grower, although the procedure is different. It has been in operation for a limited period of three years and the report proposes that, with some minor amendments, it should now be made permanent.

As a result of their experience during the War, the Swiss people felt much concern at the small proportion of bread-stuffs produced in their country, and, with the object of decreasing their dependence on foreign supplies, a State grain monopoly was established at the end of the War. This was replaced in March, 1929, by the present scheme for affording State aid to cereal growers.

The administration of the scheme is in the hands of a State Grain Office constituted under the Finance Department. A federal reserve

of grain is maintained (amounting at present to about 80,000 tons) which, together with the normal stocks of grain, is sufficient to supply Switzerland with bread for about three months. The reserve is stored partly by the State and partly by the millers, who are under an obligation to preserve the grain in good condition.

Acting through agricultural co-operative societies, the Grain Office purchases home-grown grain at a guaranteed price. The grains that may be so bought are wheat, rye, spelt, and mixtures thereof. The guaranteed price of wheat is, on an average, fcs. 8.50 per 100 kgs. (15s. 5d. per quarter of 504 lb. at par) above the price of imported wheat less Customs duties; subject to a minimum of fcs. 38 and a maximum of fcs. 45 per 100 kgs. (68s. 11d. to 81s. 8d. per quarter of 504 lb. at par). The price of the other cereals is fixed in relation to that of wheat, according to their milling value. There are also variations of price according to quality, and an alteration of the basic price is made on December 1 to allow for the lower moisture-content after that date.

The millers are compelled to take the grain so acquired at a price comparable with the world price. This obligation is not limited to a quota fixed on the miller's output; each miller is bound to take delivery of such amounts of grain as are allotted to him from time to time by the Central Grain Office, which is responsible for ensuring the proper distribution of home-grown grain to the millers.

Growers who produce, for their own consumption, wheat, rye, spelt, maize, and (in the mountains) barley are entitled to a special payment in respect of any such grain milled. Special payments are also made in respect of seed of recognized quality and grain grown above a certain altitude.

Millers are protected against foreign competition by the State regulation of imported flour, which affords them some compensation for the obligations imposed on them in connexion with the milling and storage of grain. The cost of the scheme to the State is estimated to be about Fcs. 17,800,000 per annum (about £700,000 at par). This sum is raised by levying an additional duty on all goods entering Switzerland.

The report on the working of the scheme recommends that the Grain Office should be authorized to take steps to improve the storage and handling of home-grown grain. It is also suggested that, in view of the reduced cost of production due to cheaper machinery and fertilizers, the minimum purchase price of wheat should be reduced from fcs. 38 to fcs. 36 per 100 kgs. (68s. 11d. to 65s. 4d. per quarter of 504 lb. at par).

Experience has shown that growers on a large scale sell their grain at the enhanced price and buy back such as they require. The report, therefore, recommends that, in future, a grower who delivers over a ton of grain must retain at least a quantity equivalent to 100 kgs. of decorticated grain—i.e., grain without husk—per person of his household.

The report states that the scheme has encouraged the use of the best qualities of seed and that certain varieties of home-grown grain can now compare in quality with imported grain. By altering the scale of payments on seed and by regulating the importation of foreign grain for seed, it is hoped to reduce the number of varieties of grain grown in the country and to encourage the growth of those which give the best results in milling and baking.

To afford protection against foreign imports, the right to import flour suitable for bread-making will continue to be reserved to the State.

During the three years in which the scheme has been in operation, it has been found that the safeguards for consumers of flour were

insufficient and it is proposed that the Federal Authorities shall be empowered to take such steps as they think fit to protect the interests of consumers of flour and bread.

The report states that the scheme generally has been found to work satisfactorily. It appears that every section of the community accepts the system of control loyally and regards it as a necessary measure for the encouragement of a branch of agriculture which is considered to be vital to the State.

Canada : Special Packs for Potatoes.*—In a paper read before the New Jersey Potato Association, in January, Mr. W. A. Sherman of the U.S. Department of Agriculture, Bureau of Markets, said :—

"In recent years, we have seen the invasion of the markets by special grades and packs of potatoes. I was impressed with the extent to which these are being tried when I visited in turn almost every important shipping station in Idaho during the first half of October. In one room, I saw potatoes coming directly from the car being run through a grader and over picking tables with the result that four different sizes of 'bakers,' each within the two-ounce range in weight, were being packed in boxes, while, in addition, the potatoes not symmetrical enough or not sufficiently uniform in size and shape to meet the exacting requirements of any of these four baker sizes went off the end of the belt into sacks of U.S. No. 1 and U.S. No. 2. Thus, six products, in addition to a few culls, were being obtained out of the stock in the car which as a whole would have been classed as 'Idaho U.S. No. 1.' Each of these six kinds of stock would be sold under a different description and specification as to size, weight, count, or grade. The smallest size being box-packed was, I think, a six-ounce 'baker,' possibly a four to six ounce. These were going into 15-lb. cartons, the larger baking sizes being wrapped in paper and packed in bushel boxes in every respect like North-western apples. I believe that this particular stock was clean, but not washed.

"In several other houses, washing machines have been installed. I saw one of the first of its kind which had been built and installed at an expense of about \$10,000. The process is very similar to the washing and brushing of citrus fruits in Florida. The result was a lot of potatoes so thoroughly cleaned and so much improved in appearance that it is not hard to imagine a very considerable future for the potato-washing industry. Most of the washed potatoes are going into special sacked packs, some in 15-lb. cotton, burlap or saxoline bags, others in 25 and 50-lb. bags, some perhaps into carton packs. So prepared, the potato is no more objectionable in the kitchenette than is a true fruit or a head of lettuce. They are no longer dirty things which the dainty housewife hates to handle."

National Mark Scheme for Plums.—The marketing of plums has not yet reached the stage of efficiency which is necessary to enable growers generally to take full advantage of the higher prices offered for best-quality produce.

The considerable fluctuations in cropping, the short period during which plums are in season, and the uncertain weather conditions at picking time are all factors in production which hinder the efficient marketing of the crop.

The effect of these factors can, however, be overcome to some extent by standardization. Standardization on a national

* "Co-operation and Markets News." Dept. of Agriculture, Regina, Sask.

basis not only speeds up distribution, but extends the area of demand. It thus tends to mitigate the ruinous effects of local gluts and the violent fluctuations in plum prices which occur from season to season, and generally makes for more stable conditions in the industry.

The home grower has to compete with heavy supplies of plums from abroad. Imports in the past have amounted to between 30 and 50 per cent. of the total quantity available for consumption in this country, and have even on occasion been heavier than the total home production. Most of these imports have secured their hold on the market largely by virtue of standardization of grading and packing. The National Mark scheme provides a means by which the home industry can meet the competition of the importer with his own weapons. The use of the standard grades and packages laid down will enable the home producer to place a standardized and dependable product on the market. The publicity which has been given to the National Mark during the last few years has focussed the attention of the public upon home produce. The application of the Mark to plums enables plum growers to reap the benefits of this national advertising.

With these considerations in mind, and having regard to the requests which have been received from representatives of the growers, the Ministry, in collaboration with the National Farmers' Union, has undertaken the preparation of the present scheme. Fruit salesmen and distributors already have confidence in the National Mark and the warranty of weight and condition which it implies, and welcome the addition of plums to the commodities to which it may be applied.

Grade Designation and Definition of Quality.—After consultation with the various interests concerned, a grade designation—"Selected"—and definition of quality for plums of that grade as set out on page 250 have been agreed upon for home-produced plums of the varieties named.

The designation and definition are given statutory effect in the Agricultural Produce (Grading and Marking) (Plums) Regulations, 1932, which refer only to plums grown in England and Wales of the varieties specified.

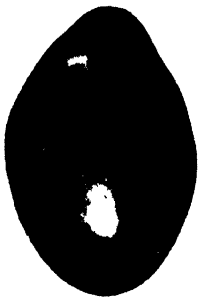
PROCEDURE AND CONDITIONS TO BE OBSERVED BY PACKERS AUTHORIZED TO APPLY THE NATIONAL MARK.

No person may mark any article, covering or label with a statutory grade designation mark (i.e., the National Mark) unless authorized to do so by or under regulations made under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931.

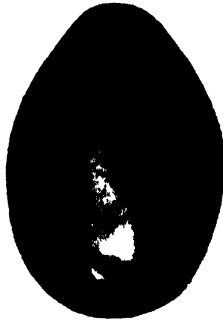
(a) *Output.*—Authority to apply the Mark will only be granted to :—

(i) Growers or packers with an anticipated output of not less than 10 tons of plums of approved varieties or with at least $1\frac{1}{2}$ acres of plum trees of approved varieties.

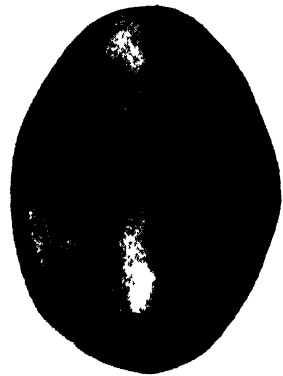
(ii) Associations of fruit growers. Members of such associations, for whom no output qualification will be prescribed for the purpose



MINIMUM SIZE
($\frac{19}{16}$ oz = 25 to 1b approx.)

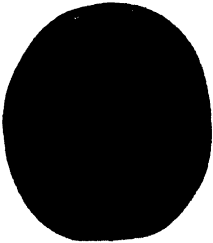


MAJORITY SIZE

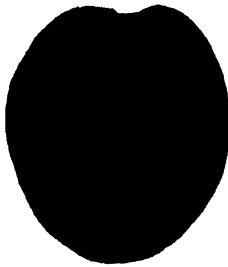


VERY LARGE

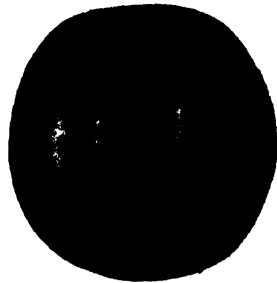
PERSHORE PURPLE & YELLOW EGG



MINIMUM SIZE
($\frac{19}{16}$ oz = 25 to 1b approx.)

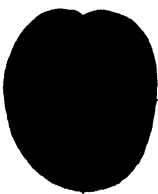


MAJORITY SIZE

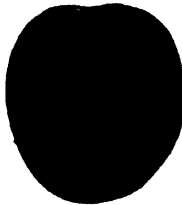


VERY LARGE

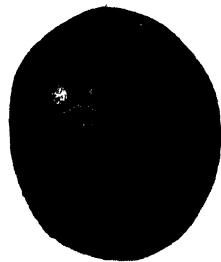
CZAR



MINIMUM SIZE
($\frac{5}{16}$ oz = 50 to 1b approx.)



MAJORITY SIZE



VERY LARGE

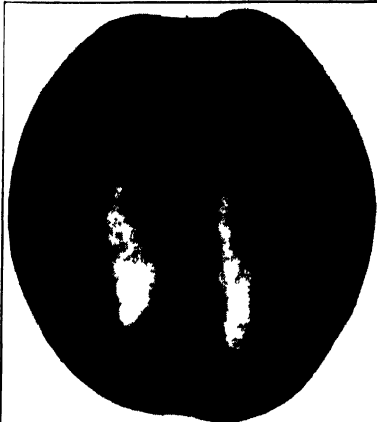
RIVERS EARLY PROLIFIC

Although plums of the approved varieties of or above the "minimum" sizes fixed by the regulations may be packed in the National Mark "Selected" grade, the bulk of the fruit so packed will normally be of the "majority" size as shown above.

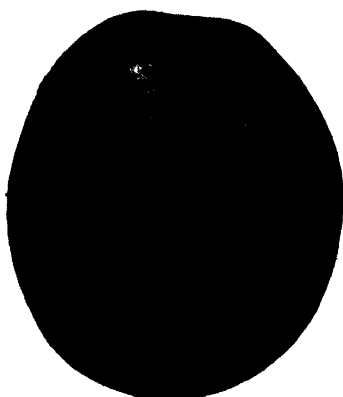
The requirements as to minimum sizes must be strictly observed.

NATIONAL MARK SCHEME FOR PLUMS.

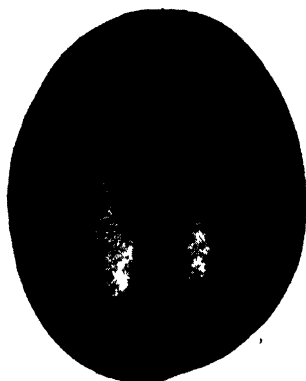
To face page 248.



VERY LARGE

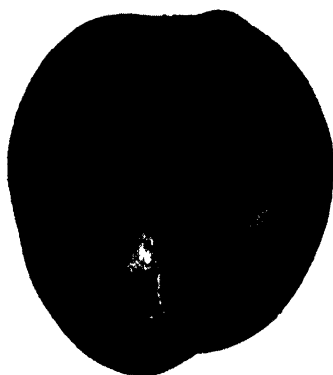


MAJORITY SIZE

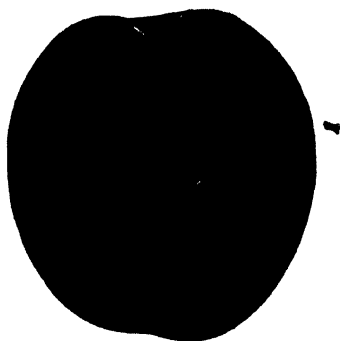


MINIMUM SIZE ($1\frac{1}{2}$ oz = 9 to 10 lb. approx.)

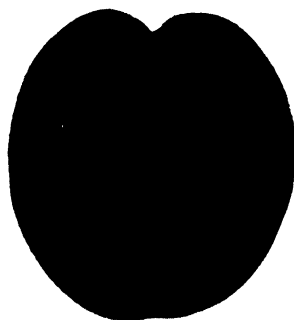
BELLE DE LOUVAIN



VERY LARGE



MAJORITY SIZE



MINIMUM SIZE ($1\frac{1}{2}$ oz = 10 to 11 lb. approx.)

MONARCH

Although plums of the approved varieties of or above the "minimum" sizes fixed by the regulations may be packed in the National Mark "Selected" grade, the bulk of the fruit so packed will normally be of the "majority" size as shown above.

The requirements as to minimum sizes must be strictly observed.

NATIONAL MARK SCHLME FOR PLUMS.

of the scheme, may receive from their association permission to apply the National Mark as agents for the association.

(b) *Grading*.—Authorized packers may only apply the National Mark to plums grown in England and Wales which are of the approved varieties and, at the time of packing, comply with the definitions of quality Prescribed for the grade designation "Selected." (See page 250.)

The majority of plums sold on the markets are cooked before consumption and very close uniformity in colour is not demanded, nor does a small amount of skin blemish meet with objection. For dessert purposes, however, the green colour of the skin should have disappeared.

Close uniformity in size is also not essential, but the inclusion of even a small proportion of undersized plums in a package has a detrimental effect on sales. Minimum sizes are, therefore, specified in the regulations; these exclude, however, only a small proportion of the fruit in a normal crop.

Uniform ripeness is of much greater importance than is generally realized. The fruit, when packed under the Mark, must, therefore, be substantially uniform in stage of maturity and contain neither full-ripe, over-ripe nor hard green fruits.

(c) *Packing*.—The method of packing each package to which a National Mark label is applied must conform to certain requirements.

In the past, the distribution of plums has been severely hampered by the use of large-sale units and returnable packages. It is in the interests of all concerned that the use of smaller units of sale and of non-returnable packages should be extended, especially for the choicer varieties. Chip baskets to hold 3 lb. (for dessert "Victoria" plums only), 4 lb., 6 lb. and 12 lb., and other non-returnables of approved types to hold 12 and 24 lb., are provided for in the scheme. To meet the requirements of growers who have not as yet felt the need for using non-returnables, the half-sieve and the strike have been included.

(d) *Use of National Mark Labels*.

(i) *General*.—Except where special authority to the contrary has been granted (see (ii) below), the National Mark may only be applied by means of the official National Mark labels which are issued, on payment, by the National Farmers' Union on behalf of the Ministry of Agriculture and Fisheries. Official National Mark labels may not be obtained from any unauthorized source and are not transferable.

Each package must bear the kind of label approved by the Ministry for that type of container. The quality of the contents of each package to which a label is applied must conform to the statutory definitions set out on page 250.

In view of the diversity of opinion as to the need for covers for chips and as to the suitability of various types of covers, the Ministry does not at present propose to issue covers printed with the National Mark, but proposes to provide a band or strip label instead. For returnable packages a tie-on label is provided.

The strip labels are printed with the net weight of the fruit contained in the package, and a space is provided for a similar statement on the tie-on labels. Before issue, all labels are over-printed with the name, number or mark of the authorized packer. When a National Mark tie-on label is used as an address label, the consignee's name and town must be stamped on the label in black letters of not less than $\frac{1}{4}$ in. in height.

Members of authorized associations of growers will obtain labels through their associations.

(ii) *Incorporation of the National Mark in Private Labels*.—As an alternative to applying the National Mark by means of

the official labels, the Ministry may license an authorized packer to incorporate the National Mark design in the design of private labels (which, if desired, may take the form of basket covers) in a manner approved by the Ministry, for application to containers of National Mark plums.

(e) *General*.—An authorized packer must allow his premises, equipment and records to be inspected at any reasonable time by any officer of the Ministry of Agriculture and Fisheries authorized in that behalf, and must allow such officer to open and inspect, on the premises either of the authorized packer or of his market-agent, any package packed by such authorized packer and bearing a National Mark label or cover, and to remove or cancel the National Mark label or cover on any package, the contents of which, in the opinion of such officer, do not comply with the definition of the statutory grade designation appearing on the National Mark label or cover, or do not accord with the weight thereon declared.

PLUMS PRODUCED IN ENGLAND AND WALES: STATUTORY DEFINITION OF QUALITY OF "SELECTED" GRADE

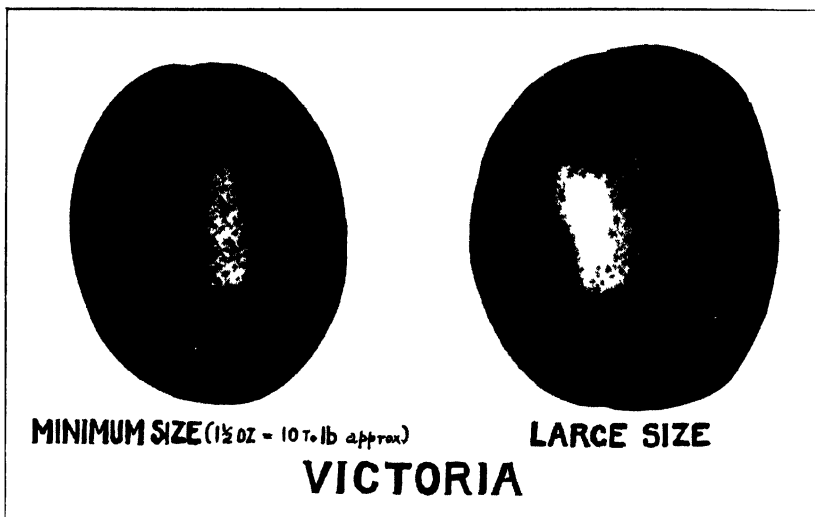
Definition of quality

1	Size* 2	Colour 3	Condition 4	Blemish 5
	Each fruit to weigh not less than (avoir-dupois):—			
Rivers' Early Prolific ..	$\frac{5}{16}$ oz.	For cooking purposes, the skin of the fruit may be green and turning colour. For dessert purposes, the green colour of the skin shall have disappeared or shall be so slight as normally to disappear by the time of retail sale.	The fruit shall be packed in a dry condition and shall have passed the hard green stage of maturity. Full ripe and over-ripe fruit shall be excluded.	The fruit shall be free from malformation and blemish which affects keeping quality, including visible "gumming" and mechanical damage. Other skin blemishes (other than russetting normal to the variety) shall not exceed a total area of $\frac{1}{4}$ in. square on any one plum.
Czar ..	$\frac{1}{8}$ oz.			
Purple Pershore ..	$\frac{1}{8}$ oz.			
Pershore Yellow Egg	$\frac{1}{8}$ oz.			
Belle de Louvain ..	$1\frac{1}{4}$ oz.			
Victoria ..	$1\frac{1}{2}$ oz.			
Monarch ..	$1\frac{1}{2}$ oz.			

* NOTE.—Plums weighing $\frac{5}{16}$ oz. each approximate 50 to the lb.

Plums weighing $\frac{1}{8}$ oz. each approximate 25 to the lb.

NOTE.—Copies of a leaflet (Marketing Leaflet No. 32) giving full details of the National Mark Plum Scheme may be obtained, post free, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.



Although plums of the approved varieties of or above the minimum sizes fixed by the regulations may be packed in the National Mark Selected grade, the bulk of the fruit so packed will normally be of the majority size as shown above. The requirements as to minimum sizes must be strictly observed.



Baskets with National Mark Label attached

NATIONAL MARK SCHEME FOR PLUMS

COUNCIL OF AGRICULTURE FOR ENGLAND

THE Thirty-Eighth Meeting of the Council of Agriculture for England was held at the Middlesex Guildhall, Westminster, on Friday, May 6, 1932.

Sir Arthur Hazlerigg, Bart. (Leicester), was elected Chairman for the year 1932, and took the Chair accordingly. A vote of thanks to the retiring Chairman, Mr. James Hamilton, J.P. (Lancs), for his services during 1931 was passed with acclamation.

Before commencing proceedings, *the Chairman* referred to the very much regretted death of Mr. G. G. Rea, C.B.E. (Northumberland), who had been a member of the Council since 1920 and had served on the Standing Committee. He also referred with the deepest regret to the death of Mr. R. C. Grey (Hunts), who had been a member of the Council since its inception and had taken an active part in its discussions. It was agreed that a letter expressing the Council's sympathy and condolence should be sent to Mr. Grey's family.

The Chairman congratulated Sir Douglas Newton, K.B.E., M.P. (Cambs), on behalf of the Council, on his appointment by the Minister as agricultural representative at the Ottawa Conference.

Mr. R. Bruford, J.P. (Somerset), was elected to the vacant position on the Standing Committee caused by the death of Mr. G. G. Rea.

Sir Charles Howell Thomas, K.C.B., C.M.G., Permanent Secretary to the Ministry of Agriculture, conveyed to the Council the Minister's great regret at not being able to be present. The reason was an important Cabinet Committee which he was compelled to attend; his place would be taken by Lord De La Warr, Parliamentary Secretary to the Ministry.

Horticultural Tariffs.—*Mr. Cecil Robinson* (Holland) moved the adoption of the Report of the Standing Committee on the subject of the extension of Horticulture, etc., following upon the new import duties. (See Appendix I.) He said that the duties would be the means of keeping millions of pounds in our own country. The Report endeavoured to indicate to what extent beans, cauliflowers, carrots, lettuce, gooseberries, etc., had been imported in recent years, and what steps were possible to grow these commodities ourselves. In his view, as a practical agriculturist, there was no reason whatever why most of these quantities of fruits and vegetables should

not be grown within our own country. The importation of two million pounds' worth of flowers and bulbs could also be substituted in large measure by home-grown products. The duties came into force, for the most part, only in January last, and the industry had not therefore been able to take full advantage of them. Announcements of this year's duties should be made as early as possible and guaranteed for at least three years, so that full advantage could be taken. *Mr. J. T. Briggs* (Soke of Peterborough) and *Mr. A. W. White* supported the mover's statements. *Lord De La Warr* said that the Report was a very encouraging one, and agreed with information that the Ministry was receiving from all over the country. As regards permanence, everyone knew that financial measures passed by Parliament were operative for one year only. The continuance of the tariffs must, however, to a very large extent depend on the industry itself. If increased production and improved quality and presentation continued as in recent times, then it would be very much easier than in other circumstances to help the industry by tariffs. A case for continuance should be prepared by the industry and submitted to the Import Duties Advisory Committee, and the sooner that was done the better. The Report was put to the Meeting and adopted.

Grading and Marking of Beef.—*Mr. Clement Smith* (East Suffolk) moved the adoption of the Report of the Standing Committee on the Inter-Departmental Committee's Report on the Grading and Marking of Beef. (See Appendix II.) He said that as regards grading costs, in January, 1931, they had been 1s. 1½d. a side; in December, 1931, the figure had been reduced to 9½d. It could be still further brought down, particularly when larger slaughterhouses were used. *Mr. Charles Roberts* (Cumberland) drew attention to what he said was a real flaw in the law in regard to private slaughterhouses. In country districts, Local Authorities had not the power to close these when they were below grade and unsatisfactory, unless they became a positive nuisance. *Lord Cranworth* (East Suffolk), *Mr. H. C. Gardner* (Worcester), *Major A. A. Dorrien-Smith* (Isles of Scilly), and *Mr. W. J. Cumber* (Berks) also spoke to the resolution, *Mr. Cumber* objecting very strongly to the suggestion that the country butcher and his slaughterhouse should be eliminated. The country butcher was the best customer to the farmer for the best class of his meat. If the marking system was to be extended it

should be extended to the country slaughterhouses. It would add unnecessary expense if animals had to be sent to central slaughterhouses and brought back again to the villages. *Lt.-Col. Sir Merrik Burrell, Bart., C.B.E.* (West Sussex), said that this suggestion was very far from the minds of the Standing Committee. What the Committee did feel was that if the National Mark scheme were to progress there would have to be large abattoirs supplying the larger centres of population. *Mr. J. Beard, Mr. Bruford, Mr. A. E. Bryant* (Bucks), and *Mr. H. B. Boden* (Staffs) also spoke to the motion, the latter moving the deletion of the sentence beginning "The Committee adds" down to "National Mark Scheme" in the last paragraph but one. The amendment was seconded by *Mr. S. Wallace* (Herts). *The Chairman* drew attention to the fact that the words were merely a statement of the other Committee's views. *Lord De La Warr* said that whether the amendment were carried or not the Ministry welcomed the Report, which it was now carefully considering with a view at a later date to introducing some practicable form of legislation on the subject. He also endorsed what Sir Merrik Burrell had said as to the misconception about country slaughterhouses. It was also possible to increase the efficiency of country slaughtereries. He promised to look into the point raised by Mr. Roberts. The mover and seconder of the amendment having withdrawn it, the Report was put to the Meeting in its original form and adopted.

Marking of Imported Potatoes.—*Mr. Denton Woodhead* moved the adoption of the Standing Committee's Report on this subject. (See Appendix III.) *Mr. Robinson* said that people were, notwithstanding the Report, hoping that something would be done to show whether potatoes were British or foreign. *Mr. W. Gilding* (Holland) agreed. *Mr. R. L. Walker* (Yorks, W.R.) said that foreign potatoes could be easily distinguished, at any rate in his district, from home-grown. He thought that the Ministry's Inspectors could very readily detect many of the foreign potatoes when they were sold as English. *Mr. Briggs* thought that 80 per cent. of imported potatoes could be identified as such. If penalties for substitution were made heavy enough, something effective could be done. *Mr. W. R. Smith* called attention to the fact that legislation already provided established machinery for dealing with this sort of question. Any body of growers of potatoes could make application under the Merchandise

Marks Act for an inquiry on proper lines. *Mr. Denton Woodhead* briefly replied to the discussion and agreed that the matter now rested with potato growers' associations for consideration as to any action they might care to take on the lines indicated by Mr. Smith. The Report was put to the Meeting and adopted.

Live-Stock Industry and Home-Killed Beef for the Forces.—

The Chairman, as Chairman of the Standing Committee, moved the adoption of the Report on this subject. (See Appendix IV.) He emphasized the suggestions (1) that the Forces should be supplied with English beef during the autumn of the year as an immediate policy to relieve the industry, and (2) that the long term policy should be worked out at Ottawa. He said that not only charity but justice began at home, and he asked the Council with one united voice to request the Government to give the matter of buying home-killed meat for the Forces in the autumn very serious consideration. It was during this period that prices slumped, and a little help would keep them at a reasonable level throughout the bad time. *Mr. J. P. Terry* (Gloucester) supported the Report. He said that to-day the live-stock industry, both as regards rearing and fattening, was in a serious position; the whole matter was one of control of imports, or a duty on imported meat.

Mr. W. W. Sampson (Dorset) congratulated the Standing Committee on its Report, which covered the purview of the resolution that was down on the paper in his name. His one regret about the Report was in regard to sheep. Prices this year were anything from 10s. to £1 a head lower than last, and sheep from last autumn had not made the money they cost to feed. The position now was that many farmers had not the money to buy stores for next season. If help did not come quickly, sheep raising would be in as bad a condition as cereal cultivation, and he laid emphasis on the two words "at once" in paragraph 6 of the Report. He hoped that this recommendation would have a better fate than that dealing with malting barley passed at the last Meeting of the Council, which he saw by that morning's paper had had no weight with the Government.

Mr. Charles Roberts said that the Committee had understated the case for the purchase and supply of meat for the Forces. The cost could easily come out of the extra duties that had been put upon the farmer, for he was hit by them not once but fifty times. All his machines and implements paid

15 per cent., and the same on all his building materials ; 20 per cent. on his netting, sacks, and bags ; all household requisites taxed, including saddlery and harness ; and 20 per cent. on sulphate of ammonia and nitrate of soda. He thought that the Council had a right to ask for some of this money back. If the Council chose to press the Government as to the reasons why they should not put a tax on meat and wheat, what could be their answer ? They could not object on principle, because they already taxed imported rabbits. Were they waiting for Ottawa ? There was a desperate need to find new markets for British manufactures. If these were found in the Colonies, they would want a *quid pro quo*. Would not that be the secured and guaranteed importation of Colonial produce in return for the importation by them of British manufactures ? The British farmer was in a very dangerous position, and the Minister of Agriculture would have to get up very early at Ottawa if we were not to find that the British farmer was once more "sold" for the benefit of the British industrialist. There was an absolute case now for the £100,000 for home-killed meat for the Forces. It was one seven-hundredth part of the total output of the live-stock farmer, and it would not save him. The least he looked for from the Government now that these extra taxes had been put upon the industry was to make the position even as good as it had been before.

Major F. F. Graham, M.P. (Cumberland), said he thought it might be best not to ask for the £100,000, which, if given now, might be held to meet the whole situation, which it did not. *Mr. H. E. S. Upcher* (Norfolk) and *Mr. Denton Woodhead* supported the Report, the latter drawing attention to the ease with which the Army could now order and deal with their supplies of frozen beef. If they were to use home-killed beef in future it would have to be supplied in the same wholesale way in similar gradings, etc. Other members who spoke were followed by *Mr. R. G. Patterson, O.B.E.* (Staffs), who said he thought producers of other articles upon which a duty was placed were not required to adopt a better method of marketing and improved organization. The agriculturist must do this, that and the other ; in other words, he must go on producing at a serious loss until he had filled the gap which would be created by the stoppage of imported produce. Before that time came, Mr. Patterson suggested that the farmer would not be in a position to produce anything. Agriculture was bleeding to death when it should be prosperous. The

foundation of national welfare was a prosperous agriculture. Everything produced in that industry did not take away from the national asset, it increased it. The attitude of giving the industrial side of the country so much importance over agriculture was utterly wrong.

Mr. J. Evens, J.P., heartily supported the Report. He was President of the British Dairy Farmers' Association at the present time, and its members in the Midlands and West were becoming very seriously disturbed. The districts that ought to be growing cereals and producing beef and mutton were turning their attention to milk in order to get ready money. The market for milk was accordingly becoming overburdened. Thousands of acres near where he lived were producing eight or nine staple products for sale: during the last few months not one of these products had paid the cost of production. There were now thousands of acres unlet because the farmer was beaten by costs of production. First, there was the cost of social services, then the cost of living, and then the fixed prices for labour. The last two he did not object to, but it was necessary that the industry should be able to pay those costs. The Government should ensure to the farmers a sporting chance of getting a "living" profit, not give them reorganization committees or commissions. *Mr. W. R. Smith* said that the Council was hardly following a sound line of procedure in this matter. The difficulties emphasized by Mr. Roberts did not arise if he (Mr. Smith) understood the theory of the duties correctly. It was that the English producer was given a monopoly of his market and was going to produce the goods cheaper. The farmer would therefore get his implements, etc., at rather less cost than previously. One would not dispute the point that agriculture was entitled to consideration from the State. It should not be overlooked, however, that agriculture was receiving more support from the State to-day than any other industry. There were the sugar-beet grants and money spent on agricultural education and research. Would the spending of this money give the desired results? In the Table attached to the Report the price of first quality Short-horns in January, 1930, was given as 6*d.* per lb. and the weighted average retail price of home-killed beef in the same month as 14*d.* 6*d.* per lb. The problem that agriculture was faced with was not so much the importation of foreign-produced beef, but the great difference that existed between those and similar figures. Many industries in the country could, on the grounds

of poverty and distress, put forward as strong a case as agriculture.

Lord De La Warr said that he found himself very largely in agreement with what *Mr. Smith* had said. Meat was the heaviest single item in the housewife's budget, and other industries, just as depressed as agriculture, would have to bear an extra charge if duties were placed upon meat. Had we the right to impose this charge upon them, and, if we did impose it, would we help the country, if, by sending up the cost of living, we did harm to the industries in the towns, to the ability of which to buy, the farmer must look for his prosperity in the future? As regards the £100,000 for home-killed meat for the Forces, his view was that if any expenditure were going to be really productive as an investment, the Government should try to find the money. But would this £100,000 be a productive investment? Would it help the farmer to continue to sell at low prices? The Army, Navy, and Air Force would deal only with the largest contractors, and large numbers of animals coming from outside this country would be involved. Whilst we were all ready to help the Irish Free State as much as Australia, that was no reason why we should be prepared to charge the taxpayer in order to subsidize one Dominion to the detriment of the agriculture of another. He was sorry that he could not give very much hope on the point of the supply of home-killed beef for the Forces at the moment. The position was that the Government had not turned the policy down. It had postponed its consideration pending an improved financial position in the country. The problem of live stock would have to be discussed at Ottawa, and the Government was at the moment trying to work out a comprehensive long-term policy.

Sir Merrik Burrell said he disagreed with *Lord De La Warr*. The live-stock industry was drowning, and he would rather see it rescued at once than take its gamble of artificial respiration after its last gasp. There were hundreds of acres of good grazing land in the country that had not had a bullock on them for one or two years, and some of it the finest grazing land in England. It took a generation to get grass land back into condition if it were allowed to go down. It was no use talking about the difficulties in the way of giving a subsidy. The problem in one form or another had to be faced. In 1929-30, the value of the live-stock industry was over £153,000,000; other farm crops were valued at £38,000,000; so that the agricultural problem

could not be solved if you disregarded live stock. From a survey of over one thousand farms in the cereal counties of Essex, Norfolk, Suffolk, and Huntingdon, the value derived from farm produce sold showed that 67 per cent. of it was from live stock. The farming industry to-day was standing up almost unprotected in a world blizzard. What it required was a full suit of clothing. Dealing with the agricultural problem in little water-tight compartments might prove very dangerous and expensive. Put the live-stock industry into reasonable prosperity and some other branches of agriculture would sink into their proper position in the whole picture. You would not be called upon to spend so much money upon them. The sugar-beet crop was being considered out of all proportion to its real value because the big things were not assisted. He was sure that Lord De La Warr would wish the Council to push behind the cart which the Ministry was trying to pull up the hill. *Col. Sir G. L. Courthope, Bt., M.C., M.P.* (East Sussex), said that he agreed with almost every word Mr. Smith had uttered, but he wished to stress one point which Sir Merrik Burrell had touched upon. That was that if the live-stock industry were allowed to collapse completely it would take the form of a very serious decline in the live-stock population of the country. Everyone hoped, with the Government, that the steps that were being taken would lead in the near future to a revival of agriculture as well as other industries. Agriculture should be in a position to take advantage of the opportunities for revival when these came. It was worth a tremendous effort now, therefore, to prevent the decline in live-stock population. £100,000 for meat for the troops might be a fleabite, but it would provide a sufficient gesture to check the decline in the breeding stock of the country. This was inevitable unless something were done.

The Chairman, in reply to the debate, said that if the attitude of the Ministry was that nothing could be done for live stock, then it might be as well to do away with the Council and with the Ministry of Agriculture for the next year, and so save two or three millions for the rest of the nation. Unless live stock was going to be considered in the near future, nothing would save British agriculture as a whole. At present, of the three parties in agriculture only the farm labourer was protected, though he might lose his employment. It did not matter whether the Home Forces were fed on meat from English-fed beasts or Irish so long as the buying came in the autumn at the time there was a glut in this country. The

measure, if carried, would stabilize prices for the time being, would be a gesture to help British farming, and might help to keep up the numbers of live stock. It was because the Government would not give protection for live stock as had been done in the case of other industries that agriculture was now asking for this. He would withdraw his resolution on the same subject in favour of the Report, which was then put to the Meeting. The Report was adopted unanimously.

Swine Erysipelas.—*Mr. J. W. Payne* (Isle of Ely) moved :—

“That this Council requests the Government to make the disease known as Swine Erysipelas a notifiable disease, with obstruction of movement and compensation for slaughter.”
(Adjourned from meeting of December 10, 1931.)

The resolution was duly seconded, put to the Meeting, after *Dr. Chas. Crowther, M.A., Ph.D., Mr. W. McCracken, J.P., F.S.I.* (Cheshire), and *Mr. J. M. Eady* (Northants) had spoken, and lost.

Fungicides for Spraying.—*Mr. J. W. Payne* moved :—

“That fungicides used for the spraying of potatoes and other crops should be made subject to similar regulations as are imposed by the Fertilizers and Feeding Stuffs Act, 1926.”

The resolution was duly seconded, put to the Meeting, and carried unanimously.

Agricultural Policy.—*Mr. W. W. Sampson* moved :—

“That this Council appreciates the assistance given to arable farmers and market gardeners in the Government's first instalment of their agricultural policy.

It also welcomes the appointment by the Minister of Agriculture of reorganization commissions under the Agricultural Marketing Act, 1931, to inquire and report as to schemes for the better marketing of milk and bacon, respectively. The Council now respectfully points out the necessity of appointing a similar commission, or commissions, for beef and mutton.”

He said that on consideration and in view of the preceding debate he wish to move only the first paragraph. This was duly seconded and put to the Meeting and carried.

Dutch Auctions for Horticulture.—*Sir Douglas Newton* moved :—

“That the Standing Committee of the Council be requested to submit to the Council a report upon the electric clock indicator system of marketing horticultural produce, as practised in Holland, France and elsewhere, with a view to its consideration for adoption in this country.”

The motion was duly seconded, put to the Meeting, and carried.

Tithes.—*Mr. H. W. Thomas (Hants)* moved :—

“ Having regard to the bad feeling existing among Tithe payers, this Council respectfully asks the Minister to convene a Conference of Tithe owners and Tithe payers at an early date.”

Sir Charles Howell Thomas said that before going to the vote the Council would like to know that the Minister had said in the House of Commons that in his view no purpose would be served by calling a Conference in existing circumstances. The Minister's view was that the remedy for the tithe difficulty was not to relieve the tithe payer of his obligations at the expense of the tithe owner or of the State, but rather to help to put agriculture in a position in which the landowner and the farmer were able to meet their tithes and other obligations. He did not know whether the Council would consider that the bad feeling existing amongst tithe payers was a sufficient reason for pressing the Minister to alter his decision. The motion was put to the Meeting, 10 voting in favour and 10 against. The Chairman gave his casting vote against it, and the resolution was lost.

APPENDIX I

REPORT FROM STANDING COMMITTEE ON THE SUBJECT OF IMPROVEMENTS TO HORTICULTURE, ETC., FOLLOWING ON NEW IMPORT DUTIES.

(1) In connexion with its review of Government Agricultural Policy as so far announced, the Standing Committee has had certain facts before it concerning the effects of the new tariff duties, under the Horticultural Products (Emergency Customs Duties) Act and the general tariff of 10 per cent. *ad valorem* under the Import Duties Act, on all commodities not specially exempt or being imports from the Dominions or Colonies, as varied by the duties announced by the Import Duties Advisory Committee on the 25th instant to come into force on the 26th instant. Both the special duties under the first Act and the general tariff and duties under the second and the exemptions to the general tariff are in the nature of temporary expedients, which will be reviewed in detail in due course, whilst the policy with regard to Dominion exports will be reviewed at the Ottawa Conference in July.

(2) For the convenience of members, a list of the present duties and special exemptions is attached to this Report. Already, in various parts of the country, evidence is forthcoming that horticulturists and others concerned in growing the kinds of produce named, the importation of which is taxed, have increased their acreages and built more glasshouses, sheds, etc. These activities have been reflected in other industries, e.g., those of horticultural builders and boiler makers, so that more labour will have been employed directly as a result of the duties.

It is the Committee's view that the opportunities thus afforded to growers should, however, be even more widely recognized by them, so that within the shortest possible time the gap between the quantities of produce required for home consumption and those produced at home may, wherever possible, be filled up.

Further consideration of this subject makes it clear at once that, except in the case of a few commodities as to which there is no likelihood

of the country ever fully supplying itself, organization within the home industry is necessary at an early date, if only to see that over-production does not occur. At the beginning, perhaps at the present time in the case of the early vegetables and salads, it may be sufficient for growers to go full speed ahead, for much more home production is needed before the home market can be supplied. Evidence of the extent of the increased production will no doubt influence the Import Duties Advisory Committee when it comes to decide on the more permanent duty or duties to be attached to the overseas supplies of the commodities they produce. But the more important matter in the long run will be seen to be that the various sections concerned should become organized as quickly as possible so that they can deal in an authoritative way with all questions of internal national supply, and give advice to the Import Duties Advisory Committee for the benefit of the growers within their groups.

Fruit.—(3) Taking the fresh fruits in order as they appear on the list of duties, we find that the imports of—

Cherries in each of the last two years amounted to about 60,000 cwt. coming mostly from the near Continental countries—Belgium, France, Holland and Italy. The duty placed upon this fruit of 3d. per lb. during May and June should help, in due time, to give our home crop an advantage in the market. It will, of course, take time to increase the amount of the home crop, but the duty should bring more home-grown cherries to market. The other effects of the duty will be watched with interest.

(4) *Currants*.—The recent average imports are about 120,000 cwt., mostly from France, Holland and Belgium. There is little question that in recent years supplies have been in excess of demand, and the crop not only in this country but in many places abroad has not paid for itself. The duty of 2d. per lb. in May, June and July of this year will no doubt improve the position for the home grower. Its announcement in December last had, we are informed, the effect of stopping the grubbing process which was previously and then going on in currant orchards, when growers had decided that the crop must be replaced by other crops. It may be expected that in view of this position growers will await the results of this year's marketing experience to see whether any further acreage of currants is necessary to supply the needed crop.

(5) *Gooseberries*.—The importation of gooseberries is not usually heavy, having been in the neighbourhood of 20,000 cwt. or so per annum in recent years. The duty of $\frac{1}{4}$ d. per lb. during the months of May and June should be found helpful in the sale of the home crop. There seems to be no reason at all to the Committee why the home crop should not be ample to meet home requirements.

(6) *Grapes (Hothouse)*.—The importation of hothouse grapes in 1930 was estimated at about 150,000 cwt., of which about one-fifth came from the Channel Islands and would, of course, be free of duty. The duty is 4d. per lb. up to June 30 and 2d. per lb. thereafter until December 11. In the second half of the year, grapes from unheated glasshouses arrive from the Continent and the fruit becomes cheaper. It is doubtful whether the duty in this case will have much effect by way of increasing the growth of home grapes, though it should tend to bring more of the home crop into the market because of the somewhat better price. The import figures will be awaited with interest.

(7) *Plums*.—The duty of 14s. per cwt. between June 1 and August 15 should be a definite help to the plum growers to market their better varieties at paying prices. It should also help the holders of the recently planted plum orchards in the West of England to pay their

way. The importations in the year 1930 totalled just short of 390,000 cwt., including 36,000 cwt. from Empire countries.

(8) *Strawberries*.—The chief imports of strawberries are from the near Continental countries, and the import duties that have been placed upon the crop of 2s. 6d. per lb. during April and May and 6d. per lb. during the first fortnight in June should be of considerable assistance to the home industry in retaining the early home markets. It is believed that under the impetus of the new duties considerable fresh acreages of strawberries will be planted this autumn. There seems to be no reason why all the strawberries required should not be grown in our own country. There has in recent years already been an increase in the strawberry acreage of certain districts, though this is largely due to the needs of the canning industry, which in recent years has not been able to obtain anything like a full supply of fruit.

(9) *General*.—The above-named fruits are the only ones that were dealt with in the preliminary list of Emergency Customs Duties under the Horticultural Products Act. Other fruits bear the 10 per cent. *ad valorem* tariff: except certain forms of preserved fruit which under the latest tariff change pay 25 per cent.; this item includes fruit pulp. Other changes in the flat rate tariff will no doubt be considered by the Import Duties Advisory Committee one by one in due course. With the additional demands for fruit for the canning industry, and especially for fruit pulp for jam makers, the prospects for home growers of fruit should become much brighter.

Vegetables.

(10) *Asparagus*.—The importation of outdoor asparagus begins about March. The duty of 4d. per lb. for the three months March, April and May should assist the efforts which our growers are making to increase the home supply.

(11) *Green Beans*.—The imports of green beans in 1930 were estimated at about 1,500 tons, most of which came from Madeira. There is, we understand, some prospect of increased supplies of green beans from glasshouses in this country, and the duty of 1½d. per lb. until June 30 should encourage this industry.

(12) *Broccoli and Cauliflowers*.—The existing duty is 3s. per cwt. until June 30. Large quantities are imported. In 1931, the estimated figure was over 40,000 tons. The Committee understands that considerable fresh acreages have been put under this crop with a view to meeting the probable decline in imports. The increase is notable in South Lincolnshire, Devon and Cornwall.

(13) *Carrots*.—The duty is 1d. per lb. up to June 30. The imports in 1930 were estimated at 23,500 tons; mostly old carrots from Holland. The early and expensive vegetable comes mainly from France and Algiers; it is understood that market gardeners and others are alive to the need of increasing the acreage under this vegetable. It may be that the old carrots should not bear a duty of so much as 1d. per lb. and that the new ones should bear a larger duty, but as to this no doubt the Import Duties Advisory Committee will take proper advice, and decide in due course.

(14) *Lettuce, Endive and Salad Chicory*.—The present duty is 6s. per cwt. up to June 30. The imports of lettuce from France, Holland and Belgium in 1930 were estimated at about 12,000 tons. Chicory, coming mostly from Belgium, was about 600 tons, and endive, from France, Belgium and Holland, about 2,000 tons. As a result of the duty, much lettuce is being produced under glass in this country during the present season, and the Committee understands that steps are being taken in sowing larger breadths of these salad vegetables, particularly of lettuce, in the market garden districts of the South-West, Scilly

Islands, and the Isle of Wight, where the climate is favourable for early crops.

(15) *Cucumbers*.—The duty is 12s. per cwt. until June 30 and 8s. per cwt. thereafter until November 30. The Committee has no special information as to the extent of the total importation of this vegetable, though it understands that no less than 2,750 tons were imported from Holland in 1931. The duty will no doubt assist home production, particularly on the land of small growers with glass.

(16) *Mushrooms*.—The duty of 8d. per lb. until December 11 is one which should give the home growing of mushrooms a considerable stimulus. The Committee understands that mushrooms can be grown successfully under widely differing climatic conditions, and that there is a considerable market in any month of the year for a moderately priced product. A crop can be produced in from eight to ten weeks by anyone who has the necessary buildings and supplies of horse manure. The Committee has no information as to the quantity of imports, except that they are fairly considerable, though the price of them is usually low, the quality not being up to the standard of mushrooms grown in this country.

(17) *Green Peas*.—The existing duty on green peas is 9s. 4d. per cwt. on unshelled and 37s. 4d. per cwt. on shelled until June 30. The importation is mostly of early peas, and appears to be from Spain, France and Italy; these sell up to 1s. per lb., but 4d. to 4½d. is said to be a more usual price. Imports drop away rapidly when the home crop appears on the market. Unless, therefore, it is possible to supply early peas by any method of forcing or increased cultivation in early districts it seems doubtful whether the early imports can be replaced. The later ones should be replaced without much difficulty.

(18) *New Potatoes*.—Very substantial quantities of new potatoes are imported from abroad in the months of April, May and June. In March and April a few thousand tons come from Spain and the Canary Islands; in May, about 50,000 tons come mainly from Spain, France, the Canary and Channel Islands; and in June about 120,000 tons come mainly from France and the Channel Islands. The period of the first year's duty on new potatoes is, however, now over, having been 18s. 8d. per cwt. from January 5 to February 29, and 9s. 4d. during March, and 4s. 8d. during April. It should be noted, however, in this connexion, that the importation into this country of potatoes from France is prohibited under the Colorado Beetle Order of 1931, so that there will be a deficiency in potato supplies for the home-crop growers to make up during May, June and July. The Standing Committee gathers that the potato growers all over the country have had this situation well in mind and that large additional acreages were this year, and are being next, given to the crop, especially in Cornwall, the Scilly Islands, and the counties of Lincs (Holland), Devon and Gloucester.

(19) *Turnips*. The duty on turnips is 1d. per lb. until June 30. Considerable quantities of tender turnips, amounting, it is said, in some years to about 2,000 tons, are imported from France, Madeira, Belgium and Italy. The Committee has no special information as to the extent to which the demand for this vegetable is being met by the home growers, but there seems to be no reason why turnip production in frames and in the warmer valleys of the South-West should not be possible.

(20) *Tomatoes*.—The duty is 2d. per lb. from June 1 to July 31, and 1d. per lb. from August 1 to October 31. The imports of this vegetable reach a very high figure throughout the year. The total in a recent year was up to 150,000 tons, mostly from the Canary Islands (70,000 tons), Channel Islands (43,000 tons) and Holland (33,000 tons). Con-

siderable efforts are being made all over the country to increase the glass acreage of this crop, though the duty seems definitely less than the case requires.

(21) *Fresh Flowers*.—The duty on a range of cut flowers of certain common varieties, and plants in flower, and foliage (excluding asparagus) 2d. per lb. until December 11, while on other cut flowers, flowers attached to bulbs and asparagus foliage the duty is 9d. per lb. until the same date. The duty on rose trees of 30s. per 100 expired on April 30: a new duty has been promulgated, however, of 20s. per 100 to run from May 1 to December 11. The growers of blooms for market have taken advantage of these duties and have supplied, as far as possible with the short notice, increased quantities of blooms. No doubt with the special duties renewed or extended more advantage will be taken next season.

(22) The list of duties which came into force on April 26 included one of 20 per cent. on vegetables (other than tomatoes) preserved in air-tight containers, but not including pickles and vegetables preserved in vinegar.

As regards all the commodities dealt with, the Council will realize that in most cases the figures of imports are not readily available, though the Ministry of Agriculture has assisted the Committee to obtain what statistics there are.

Considering the horticultural industry as a whole, the Committee is satisfied that there has been a definite readiness displayed to take advantage of the opportunities offered by these emergency duties. These came rather late in the season, so that the market gardener was unable to make the fullest use of them, and as they were and only could be in the first instance for a limited period only, they have not always gained the confidence of all growers, so as to induce them to make permanent alterations in their schemes of husbandry.

In order to permit of the growers obtaining the necessary seeds of early salads and vegetables, glasshouse crops and bulbs, in time for sowing in the late summer and early autumn, they should have information as to intended changes of tariffs, or continuance of them over next season, not later than the middle of August, and, if possible, earlier; the earlier the better. The Committee hopes, therefore, that the Imports Duties Advisory Committee will be in a position to make early announcements as to the future position, and especially to announce that the duties will be of a more permanent character than they were last season.

April 30, 1932.

IMPORTS DUTIES ON FRESH FRUIT, FRESH VEGETABLES AND FLOWERS

Under the provisions of the Horticultural Products (Emergency Customs Duties) Act, the Minister of Agriculture and Fisheries has imposed the following duties: -

	Duration	Amount of Duty
<i>Fresh Fruit</i>		
Cherries ..	May 1-June 30 (inclusive) ..	3d. per lb.
Currants ..	May 1-July 31 (inclusive) ..	2d. ..
Gooseberries	May 1-June 30 (inclusive) ..	½d. ..
Grapes	January 5-June 30 (inclusive) ..	4d. ..
(Hot-house)	July 1-December 11 (inclusive) ..	2d. ..
Plums ..	June 1-August 15 (inclusive) ..	14s. per cwt.
Strawberries	April 1-May 31 (inclusive) ..	2s. 6d. per lb.
	June 1-15 (inclusive) ..	6d. ..

	Duration	Amount of Duty
<i>Fresh Vegetables.</i>		
Asparagus ..	January 5-February 29 (inclusive)	1s. per lb.
	March 1-May 31 (inclusive) ..	4d. ..
Green Beans	January 5-June 30 (inclusive) ..	1½d. ..
Broccoli and Cauliflowers }	January 5-March 31 (inclusive) ..	4s. per cwt.
Carrots ..	April 1-June 30 (inclusive) ..	3s. ..
	April 1-June 30 (inclusive) ..	1d. per lb.
Lettuce	January 5-April 30 (inclusive) ..	8s. per cwt.
Endive		
Chicory	May 1-June 30 (inclusive) ..	6s. ..
(Salad) }		
Cucumbers ..	March 1-June 30 (inclusive) ..	12s. ..
	July 1-November 30 (inclusive) ..	8s. ..
Mushrooms	January 5-December 11 (inclusive)	8d. per lb.
Green Peas	January 5-March 31 (inclusive) ..	14s. per cwt.
Green Peas (unshelled)	April 1-June 30 (inclusive) ..	9s. 4d. per cwt.
Green Peas (shelled) ..	April 1-June 30 (inclusive) ..	£1 17s. 4d. ..
New Potatoes	January 5-February 29 (inclusive)	18s. 8d. ..
	March 1-31 (inclusive) ..	9s. 4d. ..
	April 1-30 (inclusive) ..	4s. 8d. ..
Turnips ..	April 1-June 30 (inclusive) ..	1d. per lb.
<i>Flowers, etc.</i>		
<i>Cut Flowers in the following varieties :—</i>		
Anemones	January 5-December 11 (inclusive)	2d. per lb.
Carnations & Pinks		
Heather		
Marguerites		
Marigolds		
Mimosa		
Narcissi		
(Polyanthus types)		
Star of Bethlehem		
Stocks		
Violets		
Plants in flower		
Foliage (excluding Asparagus foliage)		
Other Cut Flowers		
Flowers attached to bulbs	January 5-December 11 (inclusive)	9d. per lb.
Asparagus foliage	January 5-April 30 (inclusive) ..	30s. per 100
Rose Trees ..		
	May 1-December 11 (inclusive) ..	20s. .. 100
Tomatoes ..	June 1-July 31 (inclusive) ..	2d. per lb.
	August 1-October 31 (inclusive)	1d. ..

The above duties are in force only during the present year, or until such time as they may be amended by the Imports Duties Advisory Committee under the Import Duties Act. All other commodities not on the free list are subject to a duty of 10 per cent. *ad val.*

FREE LIST.

The following agricultural products or manurial requirements are included in the Free List:—

Wheat in grain.

Maize in grain.

Meat, that is to say, beef, veal, mutton, lamb, pork, bacon, ham and edible offals, but not including extracts and essences of meat or meat preserved in any airtight container.

Live quadruped animals.

Flax and true hemp (*Cannabis sativa*), not further dressed after scutching or decorticating; tow of flax and true hemp (*Cannabis sativa*).

Cotton seed, rape seed and linseed.

Wool and animal hair (raw), whether cleaned, scoured or carbonised or not; rags of wool not pulled; wool noils; and wool waste not pulled or garnetted.

Hide and skins (including fur skins, but not including goat skins), raw, dried, salted or pickled, but not further treated.

Mineral phosphates of lime.

Potassium carbonate, chloride and sulphate; kainite and other mineral potassium fertilizer salts.

Soya beans.

NEW DUTIES AFFECTING HORTICULTURE.

The following duties were imposed on April 25, 1932, and will remain in force for 12 months:—

Fruit preserved by chemicals or artificial heat, other than fruit preserved in sugar	25 per cent.
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Vegetables (other than tomatoes) preserved in airtight containers, but not including pickles and vegetables preserved in vinegar	20 per cent.
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APPENDIX II

REPORT FROM THE STANDING COMMITTEE ON THE SUBJECT OF THE INTER-DEPARTMENTAL COMMITTEE'S REPORT ON THE GRADING AND MARKING OF BEEF.

The Standing Committee welcomes the Report of the Second Inter-Departmental Committee on the Grading and Marking of Beef. The Council has already received and adopted Reports from the Standing Committee encouraging the standardization and marking of British beef in the interests of the producer. The Standing Committee is convinced that the only certain way to retain and possibly extend the market for home-killed beef is for producers so to organize the marketing of their product that it is (1) easily obtained by wholesalers in constant qualities and weights, and (2) indelibly marked as home-killed meat of a guaranteed quality so that consumers know exactly what they are buying at the butchers' shops. This view is put forward as applying to present conditions only. Should the prices of imported beef and mutton become further reduced and qualities improved by better methods of preservation in cold storage, then it will become increasingly difficult for the home industry to exist in the face of overseas competition. But while conditions remain no worse than they are at present, a first step which the live-stock industry should take in strengthening

its position and showing itself to be competent to supply these islands with the major portion of the meat they require is to organize its marketing on the lines suggested.

The new Report, after considering the experience of the two-and-a-half years already passed with a limited grading scheme in operation in London, Birmingham, and Yorks, W.R., recommends that the National Mark Beef Scheme should be extended to other suitable areas in the country, e.g., the district of Liverpool; that the industry should relieve the Exchequer of at least a substantial part of the burden of financing the scheme; that grading and marking be made compulsory in the districts to which the scheme is extended; and that, as a transitional measure, the Ministry of Agriculture and the Scottish Department of Agriculture be empowered to grade and mark any home-killed beef in prescribed areas to be defined by them. The Committee adds that it was impressed by the fact that beef grading and marking was more difficult and costly where large numbers of private slaughter-houses existed, and that any reorganization of slaughtering arrangements tending to the concentration of the work in large-scale abattoirs would have very beneficial effects on the National Mark Scheme.

The Standing Committee endorses the findings of the Report, and hopes that they can be speedily put into effective operation.

April 30, 1932.

APPENDIX III

REPORT FROM THE STANDING COMMITTEE ON THE SUBJECT OF THE ADVISABILITY OF AN ORDER UNDER THE MERCHANDISE MARKS ACT, 1926, REQUIRING THE MARKING OF IMPORTED POTATOES.

(1) At the last meeting of the Council (December 10, 1931), the Standing Committee was asked to inquire into the question of the marking of imported potatoes as to their country of origin under the Merchandise Marks Act, 1926, and to report to the Council.

(2) The Committee's inquiry shows that an Order could be made under Section 2 of the Act prohibiting the sale or exposure for sale or importation of potatoes unless they bear an indication of origin. Other similar Orders have been made, but the real question as regards potatoes is how far would it be possible to enforce such an Order, if made. It is obviously of no real advantage to anyone to make an Order which is unenforceable; rather the reverse, as such an Order leads to constant friction and unavailing effort on the part of Government and Local Authority officials. The Committee therefore directed its attention mainly to the question of how far it would be possible to enforce such an Order.

(3) It appears that it would not be possible to prove by examination of any potatoes whether they had or had not been imported. Clearly, any marking must be on the container of the potatoes by label or ticket, and as soon as the container is emptied the potatoes remain unmarked. In order to establish the fact that any potatoes were imported it might be necessary to grow them and prove that they were not of a variety grown in the United Kingdom. This test, besides being protracted and cumbersome, would not be final, as varieties produced abroad are sometimes the same or very similar to those grown in the United Kingdom. It is certainly the case that the bulk of "new" potatoes on the market at certain times of the year are imported, but the time of year is no proof of origin, since it is possible for small lots of home-grown "new" potatoes to be put on the market at any time.

(4) As regards importation only, it is thought that marking on importation could be enforced. The Customs Officers could be instructed

to treat sacks or barrels or other containers of potatoes not marked as goods prohibited from importation. In many cases, the potato containers are already marked on importation with the country of origin because importers send their own sacks abroad to be filled, and the Customs object to the importation of goods to which there is applied the name or trade mark of a trader in the United Kingdom unless the imported goods are accompanied by an indication of origin. Furthermore, it is thought that wholesale dealers in potatoes would probably comply with a Marking Order; but it is clear that they could, if they chose, remove the marks from the containers or re-bag the potatoes, since the power of entry of their premises under Section 9 (2) of the Merchandise Marks Act, 1926, is limited to the hours when the premises are "open for business." As regards retailers, it is thought that wholesale dealers, as a rule, make no secret of the origin of their supplies, and they would naturally be inclined to sell imported potatoes to retailers in the original containers so as to avoid the necessity for selling them by statutory cwt. under the Corn Sales Act, 1921. The sales by retail to consumers, however, are the only sales that are of real importance in connexion with the present proposal, since it is at the final sale that the consumer can, if the potatoes are required to be marked, insist upon being supplied with those marked "British" which he cannot do at present. If it were found that home-grown potatoes sold at a higher price or more quickly than imported tubers, there would doubtless be a tendency, if it were impossible to detect differences, for some retailers to disregard the Order. Others would feel themselves compelled by competition to follow suit, and it is thought that in such circumstances no general compliance with such an Order could be secured. At the same time, the Standing Committee does not desire to put aside the idea of an Order as entirely out of the question. It appreciates the point that an Order would be most useful if one were practicable and could be enforced. If, therefore, the potato industry can suggest a measure which could be operated—a thing that the Standing Committee has failed to do—then the Committee would readily support it.

April 30, 1932.

APPENDIX IV

REPORT OF THE STANDING COMMITTEE ON THE SUBJECT OF THE LIVE STOCK INDUSTRY AND THE SUPPLY OF HOME-PRODUCED BEEF FOR THE FORCES.

(1) The Live Stock Industry is in a very serious position at the present time through the falling away of the wholesale prices of beef, veal, mutton and lamb. The situation is aggravated by the fact that the cost of store cattle and sheep one and two years ago, when the animals were taken on the farms by the present feeders, was, usually, high; and in many cases farmers find that they have been feeding their stock at a loss. A similar situation has occurred once or twice in the past, when periods of low selling prices have followed periods of high buying prices for stores, but it is more serious at the present time because the wholesale prices of beef are now so low that the live stock farmer cannot make a living unless he can obtain his stores and other raw materials at less than their reasonable cost of production.

(2) The Standing Committee has already reported on the improvements which can be carried out in the marketing of beef, mutton and lamb, and it has agreed that these improvements will tend to maintain prices for standardized grades of meat and so give the industry a certain stability of market which is lacking at present. For this reason, and

without the further improvements which might be put into operation by a farmers' marketing board set up under the Agricultural Marketing Act, 1931, the Standing Committee has been strongly in favour of the adoption of the National Mark for home-killed meat. But the Committee now recognizes that such improvements made within the industry, although they may serve to reduce the cost of the marketing services and achieve somewhat better rewards for the farmers' service of production and should in any case bring more stable prices, cannot be effective in making the industry as a whole pay its way under conditions like those now existing. The truth is that the home trade is being undercut by the importation of cheap meat from abroad. There will always be a market for home-killed beef and mutton because wise people prefer it, but that market can never under the present state of free imports be expanded to the extent of the largest possible home-killed supply, because importations are too large and too cheap.

(3) The Tables, etc., which are attached provide instructive reading. They show that in spite of the wide response of the public to the "Buy British" appeal, and in spite of the increased feeding of the staffs and inmates of public institutions, etc., on home-produced meat, the live stock producer is getting less and less for his produce. A fall of 1d. per lb. in the price of an average beast on the hoof means to the farmer a less total price of about £5.

(4) The present agricultural outlook for the year makes matters, if anything, worse. The long period of winter drought, in which animals have been expensive to feed, foreshadows pastures that will be thin, with insufficient feeding for stock for some time to come. Meat will be still expensive to produce— not less so because of the new import duties—and there is unlikely to be any increase in the price it will fetch when brought to market. The reason for this is that already indicated: the farmer's price is largely governed by the price at which imported meat can be sold, and if larger supplies of the latter are brought in at low prices, then prices of home-killed meat will decline still further. It is not overstating the case to say that the predicament of the home live stock farmer has become a very serious one indeed, and if conditions are allowed to continue as at present, then the live stock industry will suffer economic collapse in the same way as the cereal industry in this country has already.

(5) Bearing these general facts in mind, it seems to the Committee that the Government should reconsider its attitude as regards the live stock section of the industry. It is true that certain articles of feeding stuffs—maize, linseed and cottonseed—and certain artificial fertilizers have been placed on the free list, and that in so far the Live Stock Industry has been considered by the Government. That consideration, however, gave the industry no advantage that it did not have before; it served rather to protect it from the full severity of increased costs which would be due to indiscriminating protection. The Committee has not considered the question of a tariff on imported meat or the limitation of quantities imported by the system of a quota, but it hopes that these matters will be placed in the forefront of discussion of Empire business at the forthcoming Conference at Ottawa. The principle of the first share of the home market to the home farmer, the second share to the Dominions and Colonies, and the third share to foreign countries should, the Committee considers, be sedulously followed, and means decided upon at Ottawa to give full effect to that principle.

(6) The Standing Committee therefore urges on the Council the suggestion that the Government should be asked to consider the whole question afresh and give what relief is possible to the industry at once, taking later action at Ottawa as suggested. It divides consideration under two heads (i) beef; (ii) mutton and lamb.

(7) Under head (1) the Committee suggests that the Army, Navy and Air Force units stationed in this country should be instructed to purchase home-killed beef for three or four days a week, or, alternatively, that one or more units or Commands should purchase home-killed beef entirely, during the autumn period of the year, when the glut of home beef supplies occurs through the flush of cattle coming off the grass. The extra expense of this service would be unlikely to exceed £100,000. We suggest that this cost be borne by the Treasury, and not by the Army, Navy and Air Force Votes, which have already been severely cut in the interests of National economy. The justification for a Treasury grant would be that it is a simple and inexpensive method of giving considerable and necessary help to an important branch of the agricultural industry which otherwise is likely to fail. The increased demand for home-killed beef at the critical period of the grazing year would keep the price from falling so seriously at a time when a considerable part of the year's supplies is on the market, and when a depression once started is very difficult to stop. The Government has already advised the people of the country to "Buy British," and the action suggested would incidentally prove that its advice is given in the serious earnest which the times require and that the Government is prepared to set the example itself. There can be little question that the lead of the Government in this respect would be followed by many public institutions and county and municipal authorities, who do not at present feed their officers, staffs and inmates on home-produced foodstuffs, particularly meat.

(8) If this policy were adopted by the Government, the Live Stock Industry might fairly be asked to see to it that beasts of the quality required by the Forces were forthcoming in the quantity required in the autumn months of the year. This could be done by an extension of the National Mark scheme for beef, which the Standing Committee has advocated on more than one occasion in the past, and does so again in a relative Report now being also laid before the Council.

(9) The question of assistance to the sheep rearing industry under (2) above is equally urgent with that of help to the cattle industry, but before the Committee is ready to consider the advocacy of some such steps as are recommended with regard to beef, it would like to see what advantage would accrue through the adoption of National Mark standards for mutton and lamb. Consumers have already indicated a wide demand for early home-killed lamb, and a few sheep farmers have already been successful in pioneer attempts at supplying this article all the year round. Others suitably placed for all-the-year-round lamb rearing may find profit in this endeavour, especially as the home market for this commodity appears to be expandable to a very considerable extent. Hotel and restaurant proprietors, as well as shipping companies and other caterers, have indicated that there is a definite shortage of good quality home-fed lamb in the early months of the year. The Committee therefore recommends that the sheep and lamb position should be carefully watched by the Government with a view to giving such assistance as may be possible as and when required.

April 30, 1932.

PURCHASES OF HOME-KILLED MEAT BY LOCAL AUTHORITIES.

The Committee has no detailed list of Local Authorities contracting for or purchasing supplies of home-killed beef, veal, mutton or lamb for schools, institutions, etc., under their control. A summary of such information as it had readily available is, however, attached, so that members can see what is being done in certain directions.

Kent County Council.—The Mental Hospitals in the county buy live stock in large lots, and the butchers attached to the hospitals kill and prepare the meat for consumption. The grades of meats bought are good quality cow beef and ewe mutton. For the period November, 1931, to March, 1932, the cost per pound—taking into consideration the purchase price of the stock and expenses and making a deduction for pelts, hides, fat, etc.—was as follows :—

English Beef.

Period of purchases.	Actual cost of various purchases per lb.		Price at which similar quality English could be purchased under contract.
	d.	d.	
November to March 1931 1932	4.55 4.5	4.5 4.9	Oct. 1, 1931 .. 7d. Jan. 1, 1932 .. 6½d.
	4.26	4.32	
	4.6	4.5	(The contract price for
	4.39	4.9	frozen on these dates would
	4.88	4.4	have been 4½d. and 4½d. per
	4.5	5.43	lb., respectively.)
	4.0	5.4	
	4.27		
	5.3		

English Mutton.

Period of purchases.	Actual cost of various purchases per lb.		Price at which similar quality English could be purchased under contract.
	d.	d.	
November to March 1931 1932	6.66 4.2	Wethers Ewes	Oct. 1 to Dec. 31, 1931 7d. Jan. 1 to March 31, 1932, 6½d.
	4.0		
	4.3		(The contract price for
	4.41		frozen on these dates would
	3.98		have been 5d. and 4½d. per
	4.74		lb., respectively.)

London County Council. The larger institutions controlled by the Council are supplied with Australian and Argentine beef and New Zealand mutton and lamb, purchases of which are made on Smithfield Market. Home-killed meat is supplied only for the Jewish patients in the Council's institutions. The total purchases on Smithfield market during 1930-31 were 373,533 stones (8 lb.) of a value of £70,435, viz.:—

	Stones (8 lb.)
Australian Beef, crops and hinds ..	66,395
Argentine Beef, fore and hinds ..	151,281
New Zealand Mutton	92,068
New Zealand Lamb	13,227
Kosher Meat	6,729

Other institutions are supplied by contract, and no detailed information is available. The value of these contracts is approximately £365,000 per annum.

Middlesex County Council.—The form of tender for the supply of meat for the use of the seven institutions under the control of the Middlesex County Council specifies Argentine chilled beef or National Mark "Prime" grade or "Good" grade Beef, English veal and either English or New Zealand mutton and lamb. The estimated quantities required for the six months commencing April 1, 1932, are as follows :—

<i>Beef.</i>						Stones (8 lb.)
Argentine or National Mark	..	..	..	..	..	15,138
National Mark only	..	..	..	..	..	10,153
<i>Veal.</i>						
English	..	..	..	..	..	4,138
<i>Mutton.</i>						
English	..	..	..	..	..	4,629
New Zealand	..	..	..	..	..	8,552

Northampton County Council.—The form of tender for the supply of meat to the Public Assistance Committee of the Council specifies English meat only. The estimated requirements of beef, veal, mutton and lamb for the six months commencing April 1, 1932, are as follows:—

	lb					
Beef	40,560
Veal	400
Mutton	13,667
Lamb	570

Staffordshire County Council.—The beef and mutton supplied to the various institutions in Staffordshire are either of English or Colonial origin. Supplies of veal are entirely English. Particulars of prices are as follows:—

Pence per lb.

<i>Beef</i>		
English	..	6½ - 7¼ (Hinds)
		4¾ - 5½ (Fores)
		5 - 1/- (Joints)
Colonial	..	4¾ - 6¼ (Hinds)
		3¾ - 4 (Fores)
<i>Mutton</i>		
English	..	6½ - 6¾ (Sides)
		8 (Wethers - Hinds)
		6 8 (Wethers - Fores)
Colonial	..	4¼ (Argentine Wether)
		3½ (New Zealand)

Birmingham Corporation.—Contractors tendering for the supply of meat to Open-Air Schools and other special schools in Birmingham are asked to quote prices for English graded "Prime" and foreign. No particulars are available as to prices or quantities.

Leeds Corporation.—In inviting tenders for beef, the Leeds Corporation Health Committee stipulates that all supplies of beef must be National Mark "Prime" grade. The first consignment under the contract was sent on July 2. A Committee of Inspection has expressed their satisfaction upon the quality and condition of the beef supplied.

AVERAGE MONTHLY PRICES (PER LB.) OF FIRST QUALITY SHORTHORNS (LIVE WEIGHT), WHOLESALE BEEF (LONGSIDES), ARGENTINE BEEF (CHILLED), AUSTRALIAN BEEF (FROZEN), AND RETAIL BEEF, AVERAGE OF VARIOUS CUTS

Year and month	First quality Shorthorns, Islington Cattle Market	National Mark Prime, London, Smithfield*	Argentine chilled†	Australian frozen†	Weighted average retail price of home-killed beef‡
	d.	d.	d.	d.	d.
1930					
January ..	6	8½	6½	5½	14·6
February ..	6	9	6	5½	14·4
March ..	5½	9	6½	5½	14·4
April ..	6	9½	5½	4½	14·3
May ..	5½	9	5	4½	14·3
June ..	5½	8½	4½	4½	14·3
July ..	5½	9½	5½	4½	14·3
August ..	5½	9	6	4½	14·3
September	5½	8½	5½	4½	14·3
October ..	5½	8	5½	4½	14·2
November	4½	7½	5½	4½	14·2
December	4½	7½	5½	4½	14·4
1931					
January ..	5½	7½	5½	3½	14·0
February ..	5½	7½	4½	3½	13·9
March ..	5½	7½	4½	3	13·9
April ..	5½	7½	4½	3	13·9
May ..	5½	7½	4½	3	—
June ..	5½	8½	4½	2½	14·2
July ..	5½	8½	4½	2½	14·2
August ..	5	8	5½	3	14·2
September	4½	7½	5½	3½	14·3
October ..	4½	7½	5	3½	14·3
November	4½	6½	4½	3½	14·2
December	4½	7	4½	2½	13·9
1932					
January ..	5	7½	3½	2½	14·0
February ..	4½	7½	4	2½	13·9
March ..	5½	8	4½	3	13·4
April ..	5½	8½	5½	3½	13·5

* The smaller comparative fall in this column's prices compared with live weight prices in column 1 is due to the fact that this column does not include offals whereas the first column does include them. The fall in the price of offals over the last four years has been about 50 per cent., and has been of the nature of a gradual and steady decline. The term "offals" includes hides or skins, offals and fat: value in 1928, £4 15s.; in 1932, £2 10s.; the decline in the offals for sheep has been from about £1 to 10s. over the same period.

† Second quality.

‡ From C.S.S.A. retail stores figures.

AVERAGE MONTHLY PRICES OF SHEEP AND LAMBS (PER LB.) AND FIRST QUALITY MUTTON AND LAMB, 1930-1932, WHOLESALE.

Month	Live sheep*	Mutton				Live lambs*	Lamb				Weighted average retail price of home-killed sheep†
		English	New Zealand	Australian	Argentine		British†	New Zealand	Australian	Argentine	
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
1930											
January ..	14½	11½	7½	6½	6½	18½	13½	9½	8½	8½	16.1
February ..	14½	12½	8½	6½	7½	20½	13½	11	9½	8½	16.1
March ..	14½	12½	8½	7	7½	20½	17½	9½	8½	8½	16.1
April ..	14½	12½	6½	5½	5½	20½	18½	9½	8½	8	16.0
May ..	14½	12½	5½	4½	4½	18½	17½	8½	7½	7½	16.1
June ..	13½	12½	6	4½	4½	17	15½	9½	7½	7½	16.2
July ..	13½	12½	5½	4½	4½	15½	13½	9½	7½	7½	16.2
August ..	13½	12	6	4½	4½	15	13½	9½	7½	7½	16.2
September ..	13½	12½	6	4½	4½	14½	12½	9½	7½	6½	16.0
October ..	13½	11½	6½	5	5½	14½	12½	9½	7½	7½	16.0
November ..	13½	11½	6½	5	5½	14	11½	8½	8	8	16.0
December ..	13½	11½	6	4½	5½	14	12½	8½	8	7½	16.1
1931											
January ..	13	11½	5½	4½	5½	15½	12½	8½	7½	7½	16.1
February ..	12½	11½	5	4	4½	17½	15½	8½	6½	5½	15.7
March ..	12½	11	4½	3½	4	19½	16½	7½	5½	5½	15.7
April ..	12½	11½	4½	3½	4½	19½	17½	7	5½	5½	15.2
May ..	12½	11½	4½	4	4½	17½	16½	7½	5½	5½	15.4
June ..	11½	11½	5½	4½	4½	15½	14½	8½	6½	6½	15.4
July ..	11½	11½	5½	4½	4½	14½	13½	8	7	6½	15.4
August ..	11½	10½	5½	4½	5	13½	11½	8	7½	7½	15.4
September ..	10½	9½	6½	4½	5½	11½	10½	8½	8	8½	15.4
October ..	10½	9½	5½	4½	4½	11½	9½	8½	7½	7½	15.3
November ..	9½	8½	4½	3½	3½	10½	9½	7½	6½	6½	15.0
December ..	9½	8½	4½	3½	4½	10½	9½	7½	6½	6½	14.1
1932											
January ..	9½	8½	4½	3½	4	12½	10½	7½	5½	5½	13.8
February ..	9½	8½	4½	3½	4½	13½	13½	7½	5½	5½	13.5
March ..	9½	8½	4½	4	4½	17½	14½	7½	6	6	13.5
April ..	10	8½	4½	4½	4½	16½	15½	7½	6½	6½	13.5

* Average of live animals at all livestock markets: estimated dressed carcass weight. Sheep are "Crossbreds."

† Includes "Scotch Hill" lamb.

‡ C.S.S.A. Stores figures.

JUNE ON THE FARM

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Weeds.—A weed has been defined as a plant growing in its wrong place. This is an exact and correct definition, but the bulk of the weeds the farmer has in mind when discussing the subject would appear to have no rightful place on the farm. What a nuisance they are and what a varied assortment is prevalent is fully realized at this season of the year. The presence of couch is almost an indication of indifferent farming, but a plant like charlock is hardly related to a system, and may be increased by deeper and more efficient cultivation.

Spurrey and mayweed are often a real nuisance when root crops are slow to germinate, and where such weeds are very prevalent it is sometimes difficult to follow the rows of sown crop when using the horse hoe.

The fallow year, whether a bare fallow is used or a root crop is sown, affords a real opportunity for weed reduction, and in many cases is designed for the purpose. The cultivations necessary to produce a tilth provide opportunities to remove and eradicate permanent weeds, and a tilth suitable for root crops is also suitable for the germination of annual weeds. It is highly important that these seedling weeds should be dealt with by means of the hoe at as early a stage as possible. Comparatively shallow hoeing will be effective in destroying most annual weeds in their early stages, but should any delay occur the roots soon lengthen, and consequently deeper and more thorough hoeing is necessary to deal with them, and in adverse weather complete destruction is much more difficult. Thorough hoeing at the right moment keeps the ground clean for a time, but just as important is the loosening of the surface soil, as this benefits the cultivated crop and brings the plants earlier to singling. If the crop is kept clear of weeds in its early stages the time during which hoeing is necessary will be shortened, and the crop will the sooner grow foliage that will protect it from the pressure of seriously competitive weeds.

Hoeing and Singling.—Root crops, such as mangolds, sugar-beet, swedes and turnips, are expensive to grow, principally because of the large amount of manual work involved. There are many efficient horse hoes, but much hoeing is done by hand, and is necessary where a thorough clearance of weeds is to be effected.

Efficient and quick hoers are necessary if the cost of the work is to be kept within the value of the benefit derived. Efficiency and speed vary to an enormous extent in individuals, and to some extent in districts. Soils vary in texture also, and this has an influence on speed, but even the casual observer cannot fail to notice the great difference that exists in the methods of experienced and skilled men. Not only are the methods different, but also the tools, which range from great deep blades of three or more inches down to a strong wire. It is true that on some soils the hoe rapidly wears down, and it would appear to be preferable to use narrow blades of a renewable type, and these are favoured in some districts. The narrow blade is a particular help when the soil is sticky, and is less liable to "fur" up, a condition that calls for frequent interruptions for cleaning and causes much more fatigue to the worker. The narrow blade is a great advantage in singling operations and in removing weeds from around single plants, as it is much easier to see the work and less soil is likely to be drawn away from the young plants—a fault too common, as serious damage may be done to the crop, particularly in very dry weather.

Efficiency and speed are encouraged by allowing workers to undertake this type of job by the piece and giving a bonus on the quality of the work, but the design of the hoe and the use of narrow thin blades that will retain their sharpness should not be neglected.

Haymaking.—In contrast with root growing the haymaking process has been largely mechanized, and wherever hay is made on a large scale the cost has been materially reduced. When hay can be made during good weather no cheaper cattle food is available on the farm.

The ultimate value of the hay is dependent on a number of factors. At this season of the year the main factor under the control of the farmer is the stage of growth at which the crop is cut. After the main portion of the plants have flowered, deterioration in feeding quality rapidly sets in, and the sooner the crop is cut the more valuable and digestible is the hay. It is well to remember that immature crops are more difficult to dry to a condition in which they can be stacked without incurring a risk of damage, and longer time should be allowed between the time of cutting and the time of stacking than would be necessary with a more mature crop.

The poor haymaking season in 1931 was responsible for much damage to hay in the south, where the usual practice is to stack

direct from the field. This is an admirable and cheap method well suited for good weather conditions, but extremely difficult when these conditions are adverse.

The methods adopted in northern districts by which the hay is preserved from the weather in small ricks in the field before being finally stacked is better fitted to combat a wet hay-making season. Really bad haymaking seasons, however, are so infrequent in the south, and the implements available are so well suited to the prevailing practice, that even a temporary change to other methods would be only a slight benefit.

Conservation of the grass crop as silage is an alternative. Where no tower silo is available silage can be made in a stack. It is not usually desirable to make a small stack, as the proportion of waste on the outside is too great. The erection of the silage stack should not be too rapid; a successful practice is to add material about eight feet in depth every second day, or a smaller quantity each day. The material should not be allowed to become too ripe before cutting or too dry after cutting. The top layers get insufficient pressure without some method of weighting. A good practice is to use really wet green forage for the top and then trim the sides and put the material trimmed off on top, and add soil, sand or heavy timber if available to give the necessary pressure.

An alternative is to build a stack of hay on top of the silage, and whilst there is always some waste the result is often a most welcome addition to the winter foods. Even with the best methods, however, stack silage is very wasteful.

Grass Land.—Grass land is now at the highest production point, particularly with regard to quantity. As stems develop the quality and digestibility begin to decline. The best pastures are those that retain a leafy type of herbage for the longest time. To some extent the nature of the grasses will be a dominating influence, and the propagation of indigenous strains of grasses which has been such a prominent feature in grassland research in recent years is decidedly encouraging.

Grassland management is neither simple nor easy. Much prominence has been given in recent years to the question of intensive complete manuring and rotational grazing. The early results were highly successful, but where the system has been in operation for a number of years and careful observation has been made, changes are noted and difficulties experienced that cannot be disregarded. The nature of the grass changes with the manuring and with close grazing. At first all

the grasses would appear to respond to higher manuring; perennial rye-grass is usually predominant in early summer and bent grass (*Agrostis*) in late summer and autumn. In practice the greater palatability of the perennial rye-grass results in the ready consumption of this grass in early summer, whereas the autumn growth of bent is less readily eaten and it consequently increases in vigour and in amount. Under such conditions the perennial rye-grass appears to get weaker and give place to the less desirable *Agrostis*. This is a tendency that should be counteracted. Different types of pastures will be affected differently and will require a type of management suited to the particular conditions. The writer's observations are mainly made on good old pastures in the south of England, and it would appear in these cases that applications of nitrogenous manures to pastures should be confined to early spring, and that the first growth should not be too closely grazed. In the interest of the pasture close grazing should be specially aimed at in the autumn, and if the autumn grasses are well eaten off the rye-grass will increase during winter and will be ready to produce bulky and nutritious grass early in the following summer.

Preparation for an early spring bite should commence in August or September with a close grazing, and if followed in late February or early March with a dressing of complete artificial manures, maintenance of quality and quantity should be economically possible. Much has been said as to the increased stock-carrying capacity of the land after intensive manuring. On good land this may have disadvantages. Parasitic and other diseases are spread on the pastures, and the greater the number of stock on a given area the more likely is infection to be spread from animal to animal.

Sheep in particular suffer in this respect, and whereas mixed grazing with cattle and sheep will mitigate the likelihood of trouble, the possibility of disease spreading more rapidly under intensive stocking conditions can never be wholly disregarded.

PRICES OF ARTIFICIAL MANURES

Description	Average prices per ton during week ended May 11					Cost per unit at London
	Bristol	Hull	L'pool	London		
	£ s.	£ s.	£ s.	£ s.	s. d.	
Nitrate of soda (N. 15½%) ..	9 0	9 0	9 0	9 0	11 7	
" " Granulated (N. 16%) ..	9 0	9 0	9 0	9 0	11 3	
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2	
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4	
Sulphate of ammonia :—						
Neutral (N. 20·6%) ..	7 0d	7 0d	7 0d	7 0d	6 10	
Calcium cyanamide (N. 20·6%)	7 0e	7 0e	7 0e	7 0e	6 10	
Kainit (Pot. 14%) ..	3 16	3 9	3 5	3 6g	4 9	
Potash salts (Pot. 30%) ..	6 1	5 14	5 11	5 11g	3 8	
" (Pot. 20%) ..	4 7	4 1	3 17	3 19g	3 11	
Muriate of potash (Pot. 50%) ..	11 9	10 17	10 11	10 18g	4 4	
Sulphate " (Pot. 48%) ..	13 12	12 19	12 16	13 0g	5 5	
Basic slag (P.A. 15½%)||	2 10c	2 0c	..	2 6c	2 11	
" (P.A. 14%)||	2 5c	1 14c	1 14c	2 1c	3 0	
" (P.A. 11%)||	..	1 9c	1 9c	..	..
Ground rock-phosphate (P.A. 26-27½%)||	2 10a	..	2 9a	2 7a	1 9	
Superphosphate (S.P.A. 16%)	3 2	..	3 5	2 17k	3 7	
" (S.P.A. 13½%)	2 17	2 9	3 0	2 12k	3 10	
Bone meal (N. 3½%, P.A. 20½%)	8 15	6 15	7 10	6 7	..	
Steamed bone-flour (N. ½%, P.A. 27½-29½%)	5 19b	5 2f	6 0	5 5	..	

Abbreviations: N.—Nitrogen; P.A.—Phosphoric Acid; S.P.A.—Soluble Phosphoric Acid; Pot.—Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 6s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc. (Agric.),

Principal, Moulton Farm Institute, Northampton.

Making Hay of Good Feeding Quality.—Inquiries which have reached the writer regarding the Solages method of hay-making have shown that farmers are interested in this system, and there are indications that attempts will be made to try it out in the forthcoming season. Ordinary methods of English hay-making have come in for considerable criticism by Cole in the College of Estate Management Report No. 1, "Systems of Dairy Farming." He states unreservedly that the "ordinary English method of making hay in a wet season is undoubtedly the worst of any methods found in Europe." The fundamental weaknesses of English hay-making are stated by him to be "excessive wetting in bad weather and excessive drying in good weather." He points out that in other and wetter countries various schemes have been devised for drying hay. In Scandinavia racks made of wire and posts are employed. These are something like ordinary high wire fences. In many parts of Scotland triangular wooden frames or tripods are used to form the cores of haycocks; and, recently, light collapsible iron tripods have been introduced for the same purpose in England. In Bavaria advantage is taken of a frame something like a clothes-horse with the hinged part horizontal. In Austria and elsewhere a stake, drilled with holes, is driven into the ground and crossbars are fixed in the drilled holes. The hay is then built round these skeleton frames.

The putting down of land to grass has made English farmers more and more dependent upon hay for winter feeding. At the same time the number of men employed on farms has been reduced, and the result frequently is that a large area of hay has to be tackled by a relatively small number of hands. Hay-making machinery is utilized to do the work formerly done by men, and this machinery, in particular the "tedder," has been criticized by Cole because of the greater loss of leaf that arises from its use. Farmers argue that it is not practicable to use Continental drying racks on many farms in England. The view is that one could not afford to spend labour on work of this nature. On the other hand, it can be argued that it is unsound to make bad hay and buy concentrated feeding stuffs for winter consumption if by taking more pains a better quality hay of greater feeding value could be produced.

Some loss of valuable nutrients is bound to occur when grass

is made into hay. Even under good conditions at least 20 per cent. of the original dry matter of the grass is lost in the process of hay-making. The use of racks in Central and Northern Europe has been found, however, to reduce the loss to 9 per cent. of the dry matter; whereas, 15 to 25 per cent. was formerly lost in ordinary hay-making. When bad weather occurs the leaching of the food nutrients by rain may account for the loss of 50 per cent. of the dry matter, and when hay is stacked in poor condition further serious loss of nutrients and deterioration of feeding value occurs in the stack. Early cutting combined with great care in the making will go far to secure the production of a good quality hay of high feeding value, which will greatly reduce the necessity for concentrated feeding stuffs in the subsequent winter. Under certain circumstances in England, the simpler type of racks or tripods, and the Solages system, which involves the use of salt (see this JOURNAL, January, 1932, p. 1063), would appear to be worth trying, while greater attention might be paid in showery weather to the making of ordinary haycocks. In wet districts hay-makers have become highly skilled in the making of haycocks, which, when well "hearted" and well raked down, particularly around the base, withstand a great deal of rain. There is all the difference in the world between a heap and a haycock. The former becomes sodden when subjected to rain, the latter may become wet on the outside, but the great proportion of the water falling on it will run off. In districts generally favoured with good hay-making weather, the art of haycock-making is surprisingly little understood. It is in districts where the weather is uncertain and often wet that haycocks are really well made. In these districts, in a wet season, there is generally a smaller proportion of damaged or bad hay than in those areas where it is generally usual to have dry sunny weather for hay-making.

Calf-Feeding.—In the rearing of calves considerable loss arises through scour. In certain areas that have been largely devoted to milk-selling, calf-rearing appears now to be definitely on the increase. Progressive milk producers prefer, wherever possible, to sell a level quantity of milk daily and to utilize their surplus for feeding to calves and other stock. Calf-rearers have, however, become somewhat discouraged by the occurrence of scour, and by the loss arising from this disease. It should be recognized that there are two kinds of scour—one, nutritional diarrhoea; the other, contagious white scour; the latter being caused by a specific organism

that may enter the body shortly after birth. Nutritional scour can be prevented by taking proper precautions in feeding. The contagious form constitutes a veterinary problem, and in dealing with it veterinary practitioners have secured good results by means of an injection of serum given shortly after birth, followed by a second injection later if the disease appears.

Nutritional diarrhoea results from irritation of the stomach, primarily caused by injudicious feeding. Calves that do not receive the colostrum in their mother's milk for the first three or four days after birth are generally more liable to nutritional scour than those that do. The feeding of the calf three times daily as distinct from twice daily in the early stages, and the dilution of the milk at the rate of three parts of milk to one part of boiled water, will help to prevent the disease—particularly where calves have been weakened by standing about in a cold market or through having undergone a long railway journey. It is important, however, that the diluted milk should be fed always at the same suitable temperature, namely, that of within a few degrees of the temperature of newly-drawn milk. The cure of the disorder consists in dosing the calf with castor oil, giving nothing but boiled warm water for the next 24 hours and then, if necessary, a drench to act both as a sedative and astringent. A drench recommended to the writer by the late Prof. Cave, of Wye College, has given excellent results. The prescription is 1 teaspoonful of laudanum, 1 dessertspoonful of brandy, and $\frac{1}{2}$ pint starch and warm water, the starch and water being made of about the consistency of milk. After this drench, ordinary feeding with whole milk, or, in specially troublesome cases, with diluted milk, three times daily, generally results in the disappearance of the scour.

Experiments conducted in Norway* in the feeding of calves—one lot on new milk and the other lot on skimmed milk, supplemented with tapioca meal—have shown that tapioca meal is a useful substitute for cream, the cream being replaced with 2.4 times its weight of tapioca meal. This is in accordance with feeding results obtained in this country, where it has been shown that flaked maize and separated milk form together an economical substitute for whole milk. It should be observed that the Norwegian experiments were with skimmed milk as distinct from separated milk. It is recognized that skimmed milk contains appreciably more butter fat than

* H. Isaacson, Royal Agricultural College, Norway.

separated milk, and this, no doubt, would, to some extent, account for the specially favourable results obtained. The most important point to note from these experiments is that a highly digestible starchy food is a suitable supplement to skimmed or separated milk for calf-rearing, and that the calf-feeder need not confine himself to any particular starchy food, but choose one that is wholesome and highly digestible, and without known deleterious effects. In this connexion, oatmeal, Sussex ground oats, or flaked maize all give satisfactory results when fed along with separated milk.

Recent American experiments* have shown that calves can be reared satisfactorily with a minimum of 15 gallons of whole milk per head, supplemented with skim milk, or re-constituted skim milk, and meals.

Feeding Young Pigs.—Pig-keepers sometimes find that little pigs, although fed on a ration that is apparently correctly balanced, suffer from anæmia. This anæmia occurs mostly in winter, and in pigs kept indoors. The trouble seems to be causing some considerable concern both in America and in Denmark, where it has been the subject of investigation by nutrition experts. In one American instance the feeding of "blue grass sod" increased the hæmoglobin content of the blood, thus relieving the anæmia, whereas green rye, green lucerne, and green oats had no beneficial effect. In experiments conducted at Missouri, U.S.A., and in Denmark the feeding of ferrous sulphate gave positive results in increasing the hæmoglobin and reducing anæmia; in Denmark the treated pigs showed considerably greater increase of weight than the untreated, and the rate of mortality was less. In this case the pigs treated satisfactorily were given 1 teaspoonful of a 2½ per cent. solution of ferrous sulphate daily from a week old until weaning.

* * * * *

* Oregon Agricultural College, State Bulletin, No. 290.

DESCRIPTION	Price per qr.		Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British ..	—	—	6 3	0 10	5 13	72	1 7	0-85	9-6
Barley, British feeding ..	—	—	7 0	0 8	6 12	71	1 10	0-98	6-2
" Canadian No. 3 Western ..	26 0	400	7 5	0 8	6 17	71	1 11	1-03	6-2
" Argentine ..	25 6	"	7 3	0 8	6 15	71	1 11	1-03	6-2
" Persian ..	24 0	"	6 15	0 8	6 7	71	1 9	0-94	6-2
" Russian ..	25 3	"	7 2	0 8	6 14	71	1 11	1-03	6-2
Oats, English white ..	—	—	8 0	0 9	7 11	60	2 6	1-34	7-6
" black and grey ..	—	—	7 10	0 9	7 1	60	2 4	1-25	7-6
" Canadian No. 2 Western ..	23 9	320	8 7	0 9	7 18	60	2 8	1-43	7-6
" mixed feed ..	18 6	"	6 10*	0 9	6 1	60	2 0	1-07	7-6
" Argentine ..	19 9	"	6 18	0 9	6 9	60	2 2	1-16	7-6
" Chilean tawny ..	22 6	"	7 17†	0 9	7 8	60	2 6	1-34	7-6
" Russian ..	22 6	"	7 17‡	0 9	7 8	60	2 6	1-34	7-6
Maize, Argentine ..	22 6	480	5 5	0 8	4 17	81	1 2	0-62	6-8
Peas, Indian ..	—	—	8 0†	0 17	7 3	69	2 1	1-12	18
" Japanese ..	—	—	25 15†	0 17	24 18	69	7 3	3-89	18
Dari ..	—	—	9 0	0 10	8 10	74	2 4	1-25	7-2
Milling offals—									
Bran, British ..	—	—	6 12	0 19	5 13	42	2 8	1-43	10
" broad ..	—	—	7 5	0 19	6 6	42	3 0	1-61	10
Middlings, fine imported ..	—	—	7 2	0 14	6 8	69	1 10	0-98	12
" coarse British ..	—	—	6 15	0 14	6 1	58	2 1	1-12	11
Pollards, imported ..	—	—	6 7	0 19	5 8	60	1 10	0-98	11
Meal, barley ..	—	—	8 0	0 8	7 12	71	2 2	1-16	6-2
" maize ..	—	—	6 5	0 8	5 17	81	1 5	0-76	6-8
" " South African ..	—	—	5 15	0 8	5 7	81	1 4	0-71	6-8
" " germ ..	—	—	6 7	0 13	5 14	85	1 4	0-71	10
" locust bean ..	—	—	6 10	0 6	6 4	71	1 9	0-94	3-6
" bean ..	—	—	8 0	1 0	7 0	66	2 1	1-12	20
" fish ..	—	—	15 10	2 16	12 14	53	4 10	2-59	48
Maize, cooked flaked ..	—	—	7 2	0 8	6 14	83	1 7	0-85	8-6
" gluten feed ..	—	—	6 10	0 15	5 15	76	1 6	0-80	19
Linseed cake, English, 12% oil ..	—	—	8 5	1 4	7 1	74	1 11	1-03	25
" " " 9% " ..	—	—	8 0	1 4	6 16	74	1 10	0-98	25
" " " 8% " ..	—	—	7 15	1 4	6 11	74	1 9	0-94	25
Soya-bean cake, 5½% oil ..	—	—	8 5*	1 13	6 12	69	1 11	1-03	36
Cottonseed cake—									
English, 4½% oil ..	—	—	4 17	1 3	3 14	42	1 9	0-94	17
Egyptian, 4½% " ..	—	—	4 12	1 3	3 9	42	1 8	0-89	17
Decorticated cottonseed meal ..	—	—	—	—	—	—	—	—	—
7% oil ..	—	—	8 10*	1 14	6 16	74	1 10	0-98	35
Decorticated ground-nut cake ..	—	—	—	—	—	—	—	—	—
6-7% oil ..	—	—	8 5	1 13	6 12	73	1 10	0-98	41
Palm-kernel cake, 4½-5½% oil ..	—	—	6 12‡	0 14	5 18	75	1 7	0-85	17
" " " meal, 4½% oil ..	—	—	7 2‡	0 14	6 8	75	1 8	0-89	17
" " " meal, 1-2% oil ..	—	—	6 5‡	0 15	5 10	71	1 7	0-85	17
Feeding treacle ..	—	—	5 0	0 8	4 12	51	1 10	0-98	2-7
Brewers' grains, dried ale ..	—	—	6 15	0 15	6 0	48	2 6	1-34	13
" " " porter ..	—	—	6 5	0 15	5 10	48	2 4	1-25	13

* At Bristol.

† At Liverpool.

‡ At Hull.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of April, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealer's commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 24s. per ton as shown above, the food value per ton is £8 16s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 6d. Dividing this again by 22-4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1-23d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 10d.; P₂O₅, 3s. 7d.; K₂O, 3s. 4d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	7 1
Maize	81	6.8	5 3
Decorticated ground-nut cake	73	41.0	8 5
„ cotton cake	71	34.0	7 15

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.61 shillings, and per unit protein equivalent, 1.44 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values" which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1931, issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 10
Oats	60	7.6	5 7
Barley	71	6.2	6 3
Potatoes	18	0.6	1 10
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 12
Beans	66	20.0	6 15
Good meadow hay	37	4.6	3 6
Good oat straw	20	0.9	1 13
Good clover hay	38	7.0	3 11
Vetch and oat silage	13	1.6	1 3
Barley straw	23	0.7	1 18
Wheat straw	13	0.1	1 1
Bean straw	23	1.7	1 19

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d. net.

* * * * *

MISCELLANEOUS NOTES

THE Agricultural History Society of America is desirous of securing for inclusion in its quarterly journal, *Agricultural History*, as complete bibliographical information as possible regarding books or essays on this subject currently published in the British Isles. Writers of essays on farming history and the history of rural life in all its phases are therefore requested to send details of their publications from time to time to the Associate Editor, Mr. G. E. Fussell, at 47 Maple Street, London, W.1. Information concerning sections of scientific works that contain historical data, works of general history or the history of specific trades or districts that contain sections dealing with agricultural history might also be included. *Agricultural History* is obtainable on payment of an annual subscription of \$3, which should be forwarded to the Treasurer, Agricultural History Society, Room 304, 1358 B Street, S.W., Washington, D.C., U.S.A.

* * * * *

BETWEEN March and April the general level of the prices of agricultural produce rose by 4 points to 17 per cent. above pre-war. Price changes were fairly

The Agricultural Index Number numerous during the month under review, but were generally of a minor character and the rise in the general index was due entirely to the change in the milk index. The level of milk prices in April was slightly lower than in March, but as the fall between March and April, 1911-13, was relatively much greater, the milk index rose by 33 points.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1927 :—

Month	Percentage increase compared with the average of the corresponding month in 1911-13.						
	1927	1928	1929	1930	1931	1932	
January	49	45	45	48	30	22	
February	45	43	44	44	26	17	
March	43	45	43	39	23	13	
April	43	51	46	37	23	17	
May	42	54	44	34	22	—	
June	41	53	40	31	23	—	
July	42	45	41	34	21	—	
August	42	44	52	35	21	—	
September	43	44	52	42	20	—	
October	40	39	42	29	13	—	
November	37	41	44	29	12	—	
December	38	40	43	26	17	—	

Grain.—The average price of wheat during April at 6*s.* and of oats at 7*s.* 5*d.* per cwt. showed no change on the month, and while the index for the former at 21 per cent. below pre-war was 2 points lower, that for oats at 5 per cent. above 1911–13 was unaltered. Barley at an average of 7*s.* 9*d.* per cwt. was 6*d.* cheaper during the month under review and the index moved downwards by 3 points to a level of 1 per cent. above the base years. At the corresponding period a year ago the price of barley fell by 2*d.* per cwt. and the relative index stood at 2 per cent. below 1911–13.

Live Stock.—Prices of fat cattle were a little higher in April than in the preceding month, but as the rise was proportionately smaller than in the base years, the index fell by 3 points to 18 per cent. above 1911–13. Values for fat sheep were unaltered on average from those ruling in March, but the index figure showed a rise of 3 points to 3 per cent. above pre-war in consequence of a fall in prices during the base period. A slight upward movement in the value of bacon pigs was again evident in April and the index moved upwards by 3 points and now stands at exactly the pre-war level. Pork pigs, however, were practically unchanged at 9 per cent. above 1911–13. Quotations for store stock were generally a little lower in April than in the previous month and the relative indices showed reductions varying from 1 to 6 points.

Dairy and Poultry Produce.—On average the contract price of milk during April was $\frac{1}{2}$ *d.* per gallon lower than in March, but in consequence of a fall of $2\frac{1}{2}$ *d.* per gallon in the corresponding period of the base years the index figure rose by 33 points to 50 per cent. above pre-war, as compared with the figure of 53 per cent. above in April, 1931. The fall in butter prices in April was somewhat less pronounced than in the base period and the index was 4 points higher at 11 per cent. above 1911–13. Quotations for cheese continued to advance, and the index was one point higher at 39 per cent. above pre-war. Prices for eggs followed their customary seasonal course, but the reduction of about $\frac{3}{4}$ *d.* per dozen during April was relatively not so great as in the base period and the index moved upwards by 3 points to a level of 7 per cent. above 1911–13. A year ago eggs were 18 per cent. dearer than pre-war. Poultry were dearer and the combined index was 4 points higher on the month at 27 per cent. above pre-war.

Other Commodities.—Prices of potatoes advanced about 10*s.* per ton during April, but as this increase was relatively much smaller than that recorded in the base period, the index

showed the substantial drop of 25 points to 139 per cent. above 1911-13, as against a level of 82 per cent. at the corresponding period last year. Hay cheapened further during the month under review and the index fell by 2 points to 32 per cent. below the level of the base period. Wool also showed a reduction in price and the index figure was 7 points lower on the month at 31 per cent. below 1911-13. A year ago the index stood at 16 per cent. below pre-war.

Index numbers of different commodities during recent months and in April, 1930 and 1931, are shown below :—

*Percentage Increase as compared with the Average
Prices ruling in the corresponding months of
1911-13*

Commodity	1930	1931	1932			
	Apr.	Apr.	Jan.	Feb.	Mar.	Apr.
Wheat	14	-32*	-20*	-24*	-19*	-21*
Barley	Nil	-2*	3	1	4	1
Oats	-11*	-15*	2	2	5	5
Fat cattle	33	20	19	19	21	18
„ sheep	56	37	10	Nil	Nil	3
Bacon pigs.. ..	76	23	-4*	-5*	-3*	Nil
Pork „	80	40	10	6	9	9
Dairy cows	30	28	23	21	20	19
Store cattle	24	23	21	23	21	16
„ sheep	43	31	Nil	-4*	-9*	-11*
„ pigs	113	63	27	14	5	4
Eggs	40	18	7	2	4	7
Poultry	55	42	27	23	23	27
Milk	58	53	54	46	17	50
Butter	30	15	8	7	7	11
Cheese	41	24	22	32	38	39
Potatoes	-39*	82	203	175	164	139
Hay	30	-10*	-25*	-28*	-30*	-32*
Wool	3	-16*	-20*	-22*	-24*	-31*

*Decrease.

* * * * *

THE report of the Agricultural Meteorological Conference, held at the Meteorological Office, London, S.W.7, on October 8 and 9 last, has now been issued. It

Agricultural Meteorological Conference, 1931 contains full accounts of the papers read at the conference, and a list of these, with the respective authors, is given below :—

Recent Progress in Meteorological Measurements and Data. (Mr. E. G. Bilham, Meteorological Office.)

Soils and Climate. (Dr. E. M. Crowther, Rothamsted Experimental Station.)

The Relation of Weather to the Appearance and Progress of Potato Blight. (Mr. A. Beaumont, Seale-Hayne Agricultural College.)

*A Bio-climatic Study of the "Lucerne Flea" (*Smynturus viridis* L.).* (Mr. D. Stewart Maolagan, Carnegie Research Fellow in the University of Edinburgh.)

The Effect of Temperature and Humidity on the Growth of Moulds and the Incidence of Disease in Crop Plants. (Dr. R. G. Tomkins, Low Temperature Research Station, Cambridge.)

Climatic Conditions in West Wales and their Effect on Crops. (Mr. Iorwerth Jones, Welsh Plant Breeding Station, Aberystwyth.)

The Action of Sunlight on Milk. (Dr. W. L. Davies, National Institute for Research in Dairying, University of Reading.)

The Effect of Light on Virus Diseases in Tomatoes. (Dr. J. Henderson Smith, Rothamsted Experimental Station.)

Discoveries on the Action of Light on Certain Disease Organisms. (Dr. W. A. R. Dillon-Weston, School of Agriculture, Cambridge.)

The Effect of Leaching with Cold Water on the Foliage of Fruit Plants. (Dr. T. Wallace, Long Ashton Fruit Research Station.)

Copies of the report (of which a strictly limited number is available) may be obtained on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

* * * * *

THE Royal Agricultural Society of England's Research Medal for original agricultural research work is again offered for award this year. This Silver Medal,

The R.A.S.E. Research Medal with an addition of money or books to the value of ten pounds, will be awarded for a monograph or essay giving evidence of a candidate's original research on any agricultural subject, or on any of the cognate agricultural sciences, or on agricultural economics. It must be signed by the candidate as his own genuine work. Candidates for the Medal must reside in Great Britain or Ireland, and must not be more than 30 years of age on September 29, 1932. The monographs or essays, either typewritten or printed, must be forwarded to reach the Secretary of the Society, 16 Bedford Square, London, W.C.1, on or before September 29, 1932. They will be adjudged by referees appointed by the Council of the Society. If, in the opinion of the referees, no monograph or essay submitted be found to attain a sufficient standard of excellence, the Society will be at liberty to reserve the Medal for award as an additional Medal in some subsequent year. The monograph or essay of the successful candidate will be published in the Journal of the Royal Agricultural Society if, in the opinion of the Council, it is suitable for that purpose. Essays already published will not be eligible for the Medal.

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland in the three months ended **Export of Breeding Stock** March, 1932, compared with the corresponding period of 1931. (From returns supplied by H.M. Customs and Excise.)

Country to which exported	Jan. to March, 1932		Jan. to March, 1931	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	12	1,050	62	13,100
Belgium	8	150	31	785
Denmark	1	60	6	497
Soviet Union (Russia) ..	115	4,334	0	0
Australia	7	3,355	32	3,015
Canada	38	2,536	0	0
Kenya	8	519	1	55
British India	0	0	18	1,240
Irish Free State ..	176	4,653	692	16,653
Southern Rhodesia ..	2	179	11	671
Union of South Africa ..	21	2,228	9	878
Other countries ..	13	414	15	1,077
Total	401	19,478	877	37,971
SHEEP AND LAMBS				
Argentina	85	1,625	57	1,380
France	53	370	0	0
Uruguay	17	235	0	0
Australia	5	350	35	915
Canada	14	240	0	0
British India	0	0	53	483
Irish Free State ..	45	210	46	229
Union of South Africa ..	3	18	120	1,095
Other countries ..	9	189	12	269
Total	231	3,237	323	4,371
SWINE				
France	8	99	1	20
Japan	2	100	3	150
Poland	0	0	74	1,110
Roumania	0	0	21	252
Spain	0	0	7	126
Yugoslavia	0	0	127	2,800
Australia	3	90	2	50
Hong Kong	0	0	15	338
Irish Free State ..	276	1,083	6	62
Union of South Africa ..	6	129	3	73
Other countries ..	5	73	8	235
Total	300	1,574	267	5,216

ALL persons interested in agriculture are invited to inspect the experiments now in progress at the Agricultural Research Station of Imperial Chemical Industries, Ltd., Jealott's Hill, Bracknell, near Maidenhead, Berks. The programme comprises experiments dealing with the most profitable methods of using fertilizers to increase the yield and quality of grain, root and green crops; the intensive management of grass land in all its aspects, including the improvement of pasture swards by timely grazing and resting; the comparison of four alternative systems of feeding a dairy herd both in and out of doors, and various methods of conserving surplus grass for winter fodder. The demonstrational small holding, which provides a practical example of the assistance rendered to the dairy farmer by fertilizers, has entered its second complete season. Other experiments relate to the chemical treatment of lawns, golf greens and fairways, and the manuring of fruit and vegetables. Visitors will be the guests of the Station at lunch or tea. It is desirable that two or three days' notice of an intended visit should be given to the Secretary at the above address.

* * * * *

THE following notice was issued by the Import Duties Advisory Committee on May 13 :—

Import Duties on Horticultural Products Under Section 3 (5) of the Import Duties Act, 1932, the Import Duties Advisory Committee are authorized to make recommendations for the imposition of additional duties on goods which will shortly become chargeable with the general *ad valorem* duty by reason of the duty under other enactments ceasing to be chargeable.

Although the Horticultural Products (Emergency Customs Duties) Act, 1931, does not expire until December, the Committee feel that in the interests of the growers, who have to make their plans early in the autumn, they must shortly take into consideration the question of the duties to be imposed on the commodities covered by that Act when the Act expires. At the same time, the Committee will consider whether additional duties ought to be imposed on any other horticultural products, including fresh fruits and vegetables, flowers and nursery stock.

The Committee are prepared to take into consideration any

representations which interested parties desire to make in regard to these commodities. All such representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, London, S.W. 1, not later than June 13 next.

* * * * *

THE following notice was issued by the Ministry of Agriculture and Fisheries on April 21 :—

The Minister of Agriculture and Fisheries

Import Duty on has issued a further Order under the
Rose Trees Horticultural Products (Emergency Customs Duties) Act, 1931, imposing a duty on foreign rose trees at the rate of 20s. per 100 during the period May 1 to December 11, 1932 (inclusive), in continuation of the provision relating to rose trees which was included in the first Order made under the Act.

The new Order, which has been published as Statutory Rules and Orders, 1932, No. 280, can be purchased from His Majesty's Stationery Office, price 1d. net. It is entitled the Horticultural Products (Emergency Customs Duties) No. 4 Order, 1932.

* * * * *

WITH the object of preventing the introduction of the Cherry Fruit Fly, the Minister of Agriculture and Fisheries has made an Order under the Destructive Insects and Pests Acts, 1877 to 1927, regulating the importation of cherries into England and Wales in the current season.

Importation Insects and Pests Acts, 1877 to 1927,
of Cherries regulating the importation of cherries into England and Wales in the current season.

Cherries grown in France will be admitted without restriction until May 27, after which date importation will be prohibited, with the exception of cherries grown within a small district around Honfleur. Details of this district are given in the Order.

Cherries grown in Italy will be admitted without restriction until June 5, after which date only those grown in the Region of Emilia will be allowed to enter ; after June 10 the importation of cherries grown in any part of Italy will be entirely prohibited.

Cherries grown in Germany will be admitted until June 26, if accompanied by a certificate of origin ; after that date no German cherries will be admitted except those certified not to have been grown south of latitude 53° N. or in East Prussia.

Certificates of origin must accompany cherries grown in any other European country if they are imported after May 27. Copies of the Order may be obtained on application to the Ministry.

Redemption of Tithe Rentcharge.—The Minister of Agriculture and Fisheries announced on May 11 that, for the purpose of the redemption of tithe rentcharge, for which application is made after May 12, 1932, until further notice, the compensation for redemption will be 24 times the net amount of the tithe rentcharge, after the deductions prescribed by the Tithe Acts, 1918 to 1925, have been made.

The National Diploma in Agriculture and the Fream Memorial Prize.—The 33rd annual examination for the National Diploma in Agriculture was held at the University of Leeds in April, and the results are now available. One hundred and sixty-eight candidates presented themselves. Twelve of these took the whole examination; seventy-three who had already passed in certain subjects appeared for the remaining portion; and the remaining eighty-three candidates took the first group of subjects.

Forty-three candidates were awarded the Diploma, and forty-three passed in a first group of subjects and are therefore entitled to take the remaining subjects in either 1933 or 1934. Three candidates obtained the Diploma with Honours.

The Fream Memorial Prize, which is awarded in connexion with the examination to the candidate who obtains the highest marks, was secured by Mr. John Heywood Cook, a student at the Seale-Hayne Agricultural College. This prize, of an approximate value of £8 this year, is provided from a fund entrusted to the Ministry as a memorial to the late Dr. Fream, and is applied to the purchase of books selected by the recipient as best calculated to assist him in pursuing his agricultural studies.

Foot-and-Mouth Disease.—A further outbreak of Foot-and-Mouth Disease occurred on April 26 in the parish of Eastbridge, near Hythe, Kent, and on May 4 it was found that disease had extended to sheep on adjoining premises. The two sets of premises concerned are in the same occupation.

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W.1, on Monday, April 25, 1932, Sir Wm. Dampier, F.R.S., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders :—

Bedfordshire and Huntingdonshire.—An Order cancelling as from May 7 the existing minimum and overtime rates of wages and fixing fresh rates of wages to come into operation on May 8, 1932, and to continue in force until February 25, 1933. The minimum rate in the case of male workers of 21 years of age and over is 30s. 6d. per week of 42½ hours (instead of 41 hours as formerly) in the week in which Whit Monday falls, 52 hours (instead of 50 hours as formerly) in any other week in summer, 39½ hours in the week in which Boxing Day falls, and 48 hours in any other week in winter, with overtime at 11d. per hour on Sundays, 10d. per hour

on Whit Monday and Boxing Day and 9d. per hour on any other day. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 6d. per hour, with overtime at 9d. per hour on Sundays, 8½d. per hour on Whit Monday and Boxing Day, and 7½d. per hour on any other day.

Cambridgeshire and Isle of Ely.—An Order fixing minimum and overtime rates of wages to come into operation on May 1, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until October 31, 1932. The minimum rate in the case of horsemen, cowmen or shepherds of 21 years of age and over remains unchanged at 37s. per week of the hours necessary for the performance of the customary duties of workers so employed. In the case of other male workers of 21 years of age and over the minimum rate is 30s. per week of 42 hours in the weeks in which Whit Monday and August Bank Holiday fall and 51 hours (instead of 50 hours as at present) in any other week during the period of the Order, with overtime at 10d. per hour on Sundays, Whit Monday and August Bank Holiday, and 8d. per hour on any other day. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5½d. per hour with overtime at 7d. per hour.

Herefordshire.—An Order continuing the operation of the existing minimum and overtime rates of wages from May 1 to June 30, 1932. The minimum rate in the case of bailiffs, waggons, stockmen or shepherds of 21 years of age and over is 36s. per week for all time (not exceeding 60 hours) necessarily spent on the care of animals. In the case of other male workers of 21 years of age and over the minimum rate is 31s. per week of 54 hours. The overtime rate for all classes of male workers of 21 years of age and over is 9d. per hour. In the case of female workers of 18 years of age and over the minimum rate is 4½d. per hour with overtime at 6d. per hour.

Lancashire.—An Order fixing minimum and overtime rates of wages to come into operation on May 1, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until April 30, 1933. The minimum rates for male workers of 21 years of age and over in the Southern Area remain unchanged at 37s. per week of 52½ hours for stockmen and teamsmen and 33s. 6d. per week of 50 hours for other workers. In the remainder of the area of the Committee (i.e., those parts hitherto known as the Eastern and Northern Areas) the minimum rates for male workers of 21 years of age and over are 40s. per week of 60 hours for stockmen and teamsmen and 37s. 6d. per week of 60 hours for other male workers. These rates are the same as those at present in force in the Northern Area. The overtime rate for all classes of male workers of 21 years of age and over is 9d. per hour (instead of 10d. per hour as at present). In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 6d. per hour for all time worked.

Merioneth and Montgomery.—An Order fixing minimum and overtime rates of wages to come into operation on May 2, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until further notice. The minimum rate in the case of stockmen, teamsters, carters and shepherds of 21 years of age and over is 32s. 6d. (instead of 34s. as at present) per week of 60 hours and the minimum rate for other male workers of similar age is 28s. 6d. (instead of 30s. as at present) per week of 64 hours. The overtime rate for all classes of male workers of 21

years of age and over remains unchanged at 9d. per hour. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5d. per hour for all time worked.

Radnor and Brecon.—An Order fixing minimum and overtime rates of wages to come into operation on May 1, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until October 31, 1932. The minimum rate for male workers of 21 years of age and over is 29s. 6d. (instead of 31s. as at present) per week of 54 hours in summer and 50 hours in winter, with overtime unchanged at 9d. per hour. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

* * * * *

Enforcement of Minimum Rates of Wages.—During the month ending May 14 legal proceedings were instituted against five employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County	Court	Fines imposed			Costs allowed			Arrears of wages ordered	No. of workers involved
		£	s.	d.	£	s.	d.	£ s. d.	
Cornwall	.. Camelford..	*	—	—	—	—	—	—	1
Devon ..	.. Totnes ..	0	10	0	—	—	—	9 14 0	1
Gloucester	.. Thornbury	5	0	0	0	14	0	4 18 8	1
Lancaster	.. Bolton ..	1	0	0	0	10	0	17 10 0	1
Nottingham	.. Nottingham	*	—	—	—	—	—	—	2
		£6	10	0	£1	4	0	£32 2 8	6

* Case dismissed.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS

ENGLAND

Bedford : Miss M. J. Carter, B.Sc., N.D.P., has been appointed Poultry Instructress, *vice* Miss F. M. Hill.

Gloucester : The post of Assistant Agricultural Instructor, lately held by Mr. T. H. Lunson, has been abolished.

Dorset : Mr. E. C. Gale has been appointed Manager of Egg-Laying Trials *vice* Mr. C. F. Elliott (deceased).

Leicester : Miss E. Gunnell has been appointed Manageress of Egg-Laying Trials.

Norfolk : The posts of Assistant Instructor in Horticulture and Poultry Adviser for West Norfolk, lately held by Mr. C. E. Grainger and Mr. E. V. Beard respectively, have been abolished.

Somerset : Mr. Alan J. Moase has been appointed Manager of Egg-Laying Trials *vice* Mr. W. E. Turner.

NOTICES OF BOOKS

Land and Life : The Economic National Policy for Agriculture. By Viscount Astor and K. A. H. Murray. Introduction by Sir William Beach Thomas. Pp. 192. (London : Victor Gollancz, Ltd. Price 5s.)

This little book is not likely to take a very high place in agricultural literature, but should serve the purpose admirably for which it appears to have been written, viz., to stimulate greater interest in, and provide some outstanding facts concerning, the great problems of farming. The volume is divided into three parts and there are also three useful appendixes and a good index.

Part I gives a general survey of the agricultural situation, and in seven short chapters it brings the background of the problem clearly into focus. Like other reformers, the authors have some difficulty in reconciling the conflicting demands of the three requirements of any sound national policy : (1) more people on the land, (2) greater food production at home, and (3) high efficiency in production. They are right, however, in insisting on the need for increasing the net output of agriculture, taken as a whole. Robbing Peter merely in order to pay Paul does not make for a healthy agriculture.

Part II consists of four chapters on wheat and one on sugar beet. Here the authors do not mince their words. Subsidies, unless for special and temporary purposes and on a small scale, are mercilessly denounced, but the *reductio ad absurdum* method which is adopted in exposing the fallacies inherent in the granting of subsidies could probably be used with equal effect against the proposals made in Part III of this book. Part II will have many admirers, but probably as many hostile critics.

In Part III the authors put forward their national policy for agriculture. Briefly, that policy is to use every pound that can be taken from the national exchequer for consolidating and developing the position of live stock and live stock products in British agriculture. Rather than spend money in bolstering up a system of corn growing that has been rendered antiquated by modern research in engineering and plant breeding, the authors' object would be to help corn-growing farmers to make the necessary change-over in their system. Much emphasis is laid upon the need for improved methods of marketing and for continued research into the many difficult production problems that still remain unsolved.

There are one or two surprising omissions. For example, nothing is said about the part that state regulation of wages should play in a national agricultural policy. Nor is any opinion expressed either for or against Mr. Orwin's view that a healthy, vigorous agriculture in Great Britain is impossible under the existing system of land tenure. These are serious omissions in a book that claims to lay down an economic national policy for agriculture.

Productive Soils. By W. W. Weir, M.S., Ph.D. 3rd revised edition. Pp. xvi + 398, 235 illustrations. (London : J. B. Lippincott Co. 1931. Price 12s. 6d.)

This work was first issued soon after the War, and it is instructive to observe the extent to which this present edition, published eleven years later, reflects the rapid changes in world conditions since then. The original edition aimed at fulfilling its title almost without qualification or apology, studying soil management with the object of increased crop production. Although writing at a time when production had already been greatly increased, the author warned his readers that unless the increase continued the problem of feeding the people would become serious. All over the world similar advice was being given and acted on so effectively that, in the opinion of

some economists, production outstripped the requirements of the people. Owing to momentary world depression and reduced consumption the problem has become inverted, and now is to increase consumption to more normal needs, when it is likely to keep pace with production.

In his third edition the author has shown his appreciation of the new situation: "In these times the agricultural problem is not that of increasing production." "The farm problem to-day . . . is to grow high-quality products at the lowest cost per ton, pound, or bushel." The Introduction is no longer devoted to the need for more production, but to a brief and very readable historical summary of the development of husbandry from prehistoric times.

The treatment of soil classification shows also some recognition of recent developments. The U.S. Bureau of Soils Classification is so presented as to show the importance of development as well as present appearance in soil classification. In addition to the disconnected types and series of this system, a map and a coloured profile diagram are given, in which the soils of the United States are grouped into regions whose typical soils are closely similar to the zonal types of the genetic classification.

This, however, is the full extent of the revision that the book has undergone. Chapters III to XXIV remain unaltered, and no change has been made in the Table of Contents and Index (except that "Yield, relatively low" has become "Yield, wheat, mediæval"). The description of field or plot tests, for example, makes no reference to recent work on soil heterogeneity or the need for replication.

It is difficult to find a niche for an American agricultural manual in Britain, where crops, climates, and farming practice are often so different, and where there are already books dealing directly with British conditions. At the same time, the American text-book will illustrate fundamental problems from a new standpoint and will contain new ideas in soil management. Because it is good from this point of view, and because of its excellent collection of photographs, this volume may be commended for study in British classes. Teachers certainly might read it with profit, for the reasons given, and for the numerous class experiments and questions that are dealt with by the author.

Regional Survey and its Relation to Stocktaking of the Agricultural and Forest Resources of the British Empire. By Ray Bourne, M.A. Pp. 169. Illustrated by air photographs. *Oxford Forestry Memoirs*, No. 13, 1931. (Oxford: The Clarendon Press, 1931. Price 15s.)

Although forestry is not primarily a subject that falls within the purview of the Ministry of Agriculture, it cannot but have a bearing upon the development of the resources of the land in this country. By so much the main subject of this work is of interest to readers of this JOURNAL. Moreover, the appendix contains a detailed regional description of the Burford, Marlow and Crowthorne district, which is one of the most developed agricultural areas of the country. It is true that a regional survey of this country presents little difficulty on the ground, and that the geological survey maps provide a basis for the more detailed work of soil survey. The large amount of work that this memoir describes indicates, however, that while the method of air survey may not be of the first importance in a densely populated country of old civilization like England, where most of the land has been reclaimed—although it may not yet be farmed on the most intensive and scientific principles—yet air survey in tropical countries or in countries of sparse population may be a valuable preliminary to

the more difficult work of ground survey. This has already been shown by work done in Burma, where work on the ground is necessarily of extremely long duration. The country is partly covered with dense forest that grows on precipitous mountains, and the ground surveyor is confronted with the physical difficulties implied by the density of rapidly-growing tropical bush and by the physical contours of the country. Air survey of such a district is comparatively simple and, when a method of interpreting the photographs has been evolved as the result of experience, is of very great value. As a means of assessing scientifically the resources of the Empire, particularly in those countries that have by reason of their climate and physical condition not yet been fully explored, air survey enables a rapid census of possibility to be made. While, therefore, it cannot be pretended that the work done by Mr. Bourne and his associates in England does any more than show that air survey is unlikely to be necessary here, it does show how this method of survey can be used advantageously in other parts of the Empire.

The Brotherhood of Trees. By R. St. Barbe Baker. Introduction by Sir J. Arthur Thomson. Pp. 64. 8 illustrations. (London: Figurehead, 18 Adam Street, W.C. 2. Price 2s. 6d.)

Modern industry is making ever-increasing inroads on the timber supplies of the world. Since the European War the number of uses for wood has risen from about five hundred to some four thousand. Moreover, apart from their economic importance, trees exert a beneficial influence on climate and agriculture. Remains of trees on the banks of vanished rivers and by the shores of dried-up lakes show that the Sahara has not always been a desert. Historians relate that at the time of Mohammed about a million Arabs invaded regions that are now arid and uninhabitable, felling forests to cultivate the land, then moving forward to repeat the work of destruction as soon as the crops had been reaped. Even at the present time large areas in equatorial Africa and elsewhere are undergoing a similar process of deforestation and consequent desiccation and depopulation. This little volume explains how the author, as afforestation officer in Kenya, by a happy inspiration inaugurated a new dance out of which emerged a fraternity animated by the boy scout idea of performing a good turn every day, one of the most practical of which was the planting of a tree. The story of this remarkable movement, its methods, objects and rapid extension, makes interesting and instructive reading, not without valuable lessons for Britons in the home land, where, it may be added, many prominent men and women interested in trees and afforestation have joined the movement and become members of the Society of the Men of the Trees.

Education for Empire Settlement. By A. G. Scholes, B.A., Ph.D. Pp. xiv+250. (London: Longmans, Green & Co. 1932. Price 7s. 6d.)

The sub-title, "A Study of Juvenile Migration," indicates more precisely the scope of this volume, which forms No. 6 of the Imperial Studies of the Royal Empire Society. Part I is an historical account of the settlement overseas of juveniles—young people under the age of 21 years unaccompanied by parents or guardians—from its beginnings at the time of the industrial revolution well nigh a century and a half ago up to the year 1914. The second section is devoted to modern developments: the Empire Settlement Act, 1922, and a mass of information concerning migration to Canada, Australia, New Zealand and South Africa. Part III is a study of the social aspects of juvenile migration, with special reference to education. Overseas, the demand is for those who will become engaged in primary production, the males for work on the land and the females for domestic service, and

the physical, mental and moral quality must be such as to suggest progression from the status of labourer to that of ownership of land. The difficulty of maintaining a sufficient stream of suitable settlers of British race from a population urban to the extent of 80 per cent., in the face of competition from the peasant proprietary systems of Scandinavia and Middle Europe, is apparent. Happily, one of the cardinal facts established by experience lies in the remarkable unanimity with regard to the success of juvenile migration. Not only is it successful: it is practicable on a large scale. Nor does the demand for youthful settlers vary greatly with economic conditions, as in the case of adults, and it has never been fully met. Dr. Scholes sees hope of improvement for British overseas settlement in two main directions; the first, lightly passed over as outside his theme, in an increase of small holders, and the second in a rural inspiration in elementary and secondary school teaching. Apart from educationists and social workers this volume should appeal to those who look to Ottawa.

The Provision of Credit with Special Reference to Agriculture. By H. Belshaw, M.A., Ph.D. With two Chapters on the Provision of Rural Credit in England, by R. R. Enfield. Pp. xvii + 326. (Cambridge: W. Heffer & Sons, Ltd., 1931. Price 10s. 6d. net.)

Professor Belshaw has written a very useful book, which deserves the attention of students of rural finance. It is divided into four parts, the first containing a general discussion of the principles of credit, while the second describes the special features of agricultural credit, and the third and fourth are concerned with typical organizations of long-term and short-term agricultural credit respectively.

In dealing with the elements of the rural credit problem, the author emphasizes special features that distinguish it from the problem of industrial credit. He classifies the various purposes for which credit is required, examines their relative importance, and sets out in general terms the requirements of a good system of credit for agriculture. The questions of assessment of risk and adequacy of security are covered in an excellent manner.

Then follows a general description of the usual sources of credit—such as commercial banks, insurance and trust companies, dealers and other tradespeople and private lenders. Examples of long-term credit institutions are drawn from the German *Landschaften* of pre-war days, and the Federal farm loan system in the United States of America, together with a fuller account of the system in New Zealand, in which Dr. Belshaw, by reason of his position as Professor of Economics in Auckland University College, New Zealand, is more particularly interested.

The descriptive parts of the book extend to an account of the Raiffeisen and Schulze-Delitzsch Banks in Germany without, however, giving an account of post-war changes. More important are the chapters dealing with the intermediate credit systems in the United States and the short-term credit organizations in New Zealand. The latter is a more detailed account, and deserves careful study. The book also contains two chapters by Mr. R. R. Enfield on the provision of rural credit in Great Britain; these are concerned primarily with the long-term and short-term provisions of the Agricultural Credits Act, 1928.

The Agricultural Crisis. Vol. II. League of Nations Publications, II, Economic and Financial, 1931. II. B.1211. Pp. 113. (London: Allen & Unwin, Ltd. Price 7s. 6d.)

This volume, the second of the series published by the League of Nations on the Agricultural Crisis, deals with the position of agriculture in seven countries, and the spread between the prices paid to producers and the prices paid to consumers in eleven. The publication

is the result of an inquiry made by the Economic Committee of the League with particular reference to the wheat crisis, and contributions relating to the different countries were prepared by experts of outstanding authority amongst their own people. It would be impossible in a brief notice of so comprehensive a volume to deal fully with its contents: the information it contains does not lend itself readily to condensation. It will be sufficient perhaps to say that a perusal will afford the reader a clear conception of the position of agriculture in North America, in Eastern Europe, in China, Colombia and Portugal.

Problems of Milk Distribution. By F. J. Prewett. Pp. 31. (London: Humphrey Milford, Oxford University Press. Price 1s.)

This is a comprehensive survey of existing conditions governing the production and distribution of milk in this country. Although no new factors are brought to light the author gains his object by exposing the chaotic conditions at present existing in the marketing of milk, proving that the problem that faces the farming community cannot be solved locally, and showing clearly that the path to prosperity lies in the rationalization of the industry on national lines. Emphasis is laid on the fact that in the Agricultural Marketing Act, 1931, machinery exists which, if taken advantage of, would enable farmers greatly to strengthen their present position.

Strawberry, Bush and Stone-Fruit Growing for Profit. By J. W. Morton. Pp. 68. (London: Eyre & Spottiswoode. Price 2s.)

The information given in this brochure will be welcomed by growers anxious to keep abreast with up-to-date methods of bush fruit cultivation. In small compass a remarkable amount of practical detail has been compressed. The notes on propagation are particularly useful and admirable emphasis is laid on the necessity of planting suitable varieties and securing good strains.

ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous

Hunter, H. (Edit.).—Baillière's Encyclopædia of Scientific Agriculture, in 2 Vols. (xvi + 1362 pp. + 29 plates.) London: Baillière Tindall & Cox, 1931, 63s. [63 (03).]

Oxford University, Agricultural Economics Research Institute.—Progress in English Farming Systems, VI. High Farming, by C. S. Orwin. (24 pp.) Oxford: at the Clarendon Press; London: Humphrey Milford, 1931. 1s. [338.1 (42); 63.191.]

Street, A. G.—Farmer's Glory. (312 pp.) London: Faber & Faber, 1931, 7s. 6d. [63 (42); 63 (71).]

Hartley, Dorothy.—Thomas Tusser. His Farming in East Anglia. (195 pp.) London: Country Life, 1931, 21s. [63 (42); 63 (022).]

Bourne, K.—Oxford Forestry Memoirs. No. 13, 1931. Regional Survey and Its Relation to Stocktaking of the Agricultural and Forest Resources of the British Empire. (169 pp. + 12 plates, detached.) Oxford: at the Clarendon Press; London: Humphrey Milford, 1931. 15s. [52; 55.]

Conference on Power Farming.—Speeches at the Conference arranged by the Hampshire County Council Agricultural Education Committee at Winchester, November 13, 1931, under the chairmanship of Viscount Lymington. (11 pp.) [63.17.]

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NOTES FOR THE MONTH

THE Ministry of Agriculture and Fisheries' report of proceedings under the Agricultural Wages (Regulation) Act, 1924, for the year ended September 30, 1931, has just been issued.* The report expresses great satisfaction that during a period of unprecedented economic difficulty the provisions of the Act have operated without any serious breakdown in any part of the country, and tribute is paid to the spirit of reasonableness and compromise which animates the representatives of employers and workers on the Agricultural Wages Committees, and to the public-spirited manner in which the chairmen and impartial members discharge their heavy responsibilities in securing a determination of the issues involved.

In reviewing the activities of the Committees, attention is called to the unusual number of variations made in the minimum rates of wages during the year concerned. Thirteen of the 47 Committees made either decreases in the weekly minimum wage or increases in the hours of work that the employer can require for that wage. In the five areas in which the minimum weekly wage for ordinary adult male workers was reduced, the reductions ranged from 1s. to 2s. and resulted, in one area, in a weekly minimum of 28s.; for some years past there had been no minimum wage of less than 30s. per week applicable to adult male workers in any part of the country. It is noted that although the changes in the minimum weekly wages were of importance to the particular counties affected, they were not sufficiently considerable in the aggregate to reduce the average of the minimum wages for ordinary adult male workers over England and Wales as a whole below 31s. 6½d. per week as against the 31s. 8d. at which it had stood for several years previously. Eight Committees effected increases in the number of hours covered by the minimum weekly wage, the increases ranging from 1½ to 2½ hours per week. The average number of hours for which the weekly

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 1s. 3d., post free 1s. 5d.

minimum wage is payable was in consequence increased from 51½ to 51¾ per week for the eight summer months, the winter hours remaining at about 49½ per week.

The report goes on to mention that during the five months following the close of the period to which it relates, 11 further Committees made reductions in the minimum weekly wage for ordinary adult male workers of from 6d. to 3s. 6d. and 7 Committees effected increases of from 1 to 3 in the number of hours which the minimum weekly wage covers. By March 1, 1932, the average of the minimum weekly wages for the country as a whole had fallen to 31s. 4d.

It is pointed out that the calculations of the average weekly minimum wages take no account of overtime payments or of additional earnings at special seasons such as harvest, nor of the higher wages usually earned by workers employed in tending animals. Moreover, although the minimum rates tend to become the standard wages, there is undoubtedly a certain proportion of cases in which workers receive better terms.

Included in the report is an account of the Ministry's work of securing that the minimum rates are duly observed, particulars being given of the results of the Inspectors' investigations which, during the period concerned, were on a specially extensive scale.

In the appendixes to the report, much detailed information is given in tabular form including particulars of the minimum and overtime rates of wages for all classes of workers in operation during the year.

* * * * *

THE Wheat Commission was formally appointed by the Minister of Agriculture and Fisheries, the Secretary of State for Scotland and the Secretary of State for Home Affairs, acting jointly, on June 1, 1932, and is constituted as follows :—

Chairman : The Right Hon. the Earl Peel, P.C., G.C.S.I., G.B.E.

Vice-Chairman : Mr. H. D. Vigor, O.B.E., of the Ministry of Agriculture and Fisheries.

As representing the interests of the growers of home-grown millable wheat.

Mr. J. Beard (London) .. President, Central and Associated Chambers of Agriculture.

- Mr. J. G. Harris (Yorkshire) .. National Farmers' Union.
 Mr. G. C. Mercer (Midlothian) Vice - President, National
 Farmers' Union of Scotland,
 and Member of Scottish
 Chamber of Agriculture.
 Mr. E. W. K. Slade, J.P., C.A. Chairman, Cereals Committee,
 (Berkshire) National Farmers' Union.
 Mr. G. M. Strutt (Essex) .. Central Landowners' Asso-
 ciation.

As representing the interests of millers of flour.

- Mr. S. Armstrong (Suffolk) .. Past - President, National
 Association of British and
 Irish Millers.
 Mr. W. T. Charter (Cambridge) Chairman of the Milling Sub-
 Committee, English Co-op-
 erative Wholesale Society.
 Mr. J. A. Shone (Lancashire) Past - President, National
 Association of British and
 Irish Millers and of the
 Liverpool Corn Trade
 Association.

As representing the interests of importers of flour.

- Mr. F. T. Collins (London) .. President, National Associa-
 tion of Flour Importers.

As representing the interests of dealers in home-grown millable wheat.

- Col. E. P. Clarke, D.S.O. President, National Asso-
 (Suffolk) ciation of Corn and Agri-
 cultural Merchants.
 Mr. Herbert Smith (London) Secretary, National Asso-
 ciation of Corn and Agri-
 cultural Merchants.
 Mr. A. E. K. Wherry, O.B.E. Past - President, National
 (Lincolnshire) Association of Corn and
 Agricultural Merchants.

As representing the interests of bakers of bread.

- Mr. F. Nevill Jennings, M.C. Chairman, Incorporated So-
 (London) ciety of Principal Whole-
 sale and Retail Bakers.

As representing the interests of consumers of flour.

- Mr. H. A. M. Barbour .. Northern Ireland.
 Mr. A. Buchanan .. Scottish Consumers' Co -
 operative Movement.

Sir Geoffrey L. Corbett, K.B.E., Chairman of the Food Council.
C.I.E.

Mr. C. E. Palmer National Association of
Biscuit Manufacturers.

The following Orders and Regulations have been made under the Wheat Act, 1932 :—

The Wheat Fund Regulations, 1932, dated June 13, 1932 (S.R.O. 1932, No. 443), requiring all moneys forming part of the Wheat Fund to be paid into the Bank of England, and as to the investment of such moneys.

The Wheat Commission (Approval of By-laws) No. 1 Order, dated June 16, 1932 (S.R.O. 1932, No. 472), approving by-laws of the Wheat Commission.

The Wheat (Anticipated Supply) No. 1 Order, dated June 16, 1932 (S.R.O. 1932, No. 469), prescribing the anticipated supply of home-grown millable wheat.

The Wheat (Quota Payments) No. 1 Order, dated June 16, 1932 (S.R.O. 1932, No. 470), prescribing quota payments to be made by every miller and every importer of flour.

* * * * *

THE Wheat Commission, under the chairmanship of the Right. Hon. The Earl Peel, P.C., G.S.C.I., G.B.E., which was appointed on June 1, has, in the exercise of its powers under the Wheat Act, made the Wheat (Quota Payments and Registration) By-laws, 1932. These By-laws have been approved by the Minister of Agriculture and Fisheries and the Secretaries of State concerned with Agriculture in Scotland and Northern Ireland.

The By-laws contain, in Part I, provisions relating to quota payments, and in Part II provisions relating to registration of wheat growers.

The provisions in Part I relating to quota payments deal with :

- (1) The ascertainment and payment of sums payable by millers and importers of flour in respect of quota payments ;
- (2) The making and allowance of repayments to exporters in respect of flour exported or shipped as stores, and in respect of exported bread ;
- (3) The exemption of millers, by provender millers' certificates, from liability to make quota payments in respect of meal, and
- (4) Supplementary provisions dealing with :—
 - (a) mixtures the substances contained in which, not produced by the milling of wheat, shall not be deemed to form part of the flour, and
 - (b) the procedure in the case of disputes as to whether any substance is flour or as to whether any substance is bread.

Copies of the By-laws and of certain forms that will be used in connexion with quota payments have been sent by the Wheat Commission, with a circular letter, to all firms known to be importers of flour and to all millers who are believed to come within the class of "quota-paying" millers. Any miller or importer of flour who has not received the Commission's circular letter is advised to apply to the Secretary of the Wheat Commission, Queen Anne's Chambers, 31 Tothill Street, Westminster, S.W. 1, when copies will immediately be sent to him.

The Wheat Commission also has issued to nearly five thousand persons who are known to be "engaged in milling" another circular letter forwarding forms of application for a provender miller's certificate for use if they desire the Wheat Commission to grant them such certificate.

Bakers who export bread from the United Kingdom may obtain from the Wheat Commission copies of the form of application for the repayment to them of quota payments in respect of exported bread, and it is hoped to make arrangements for a supply of these forms to be kept by the Ulster Bakers' Association for issue to those bakers in Northern Ireland who export bread to the Irish Free State.

In connexion with Part II of the By-laws relating to the registration of growers of wheat, the Wheat Commission desires to make known the arrangements that have been made to secure that all farmers growing wheat in the United Kingdom this year shall be informed of the necessity to apply for registration by the Commission.

It has been arranged with the departments responsible for agriculture in England and Wales, Scotland and Northern Ireland respectively, that all occupiers of land who show, on their June 4 return of acreage and live stock, that they have any area planted with wheat shall receive as soon as practicable a copy of the form of application for registration.

This form must be completed and sent to the Wheat Commission by the wheat grower concerned if he desires to be placed upon the Wheat Commission's register of growers of wheat in the United Kingdom. *Unless the grower is registered by the Wheat Commission he will not be eligible to receive the deficiency payments provided for under the Wheat Act in respect of any millable wheat grown and sold by him.*

It is therefore of the utmost importance to every wheat grower in the United Kingdom that he should not overlook the application form, but should complete it promptly and

post it to the Commission. An acknowledgment of the receipt of the form will be sent by the Wheat Commission as soon as possible after the application has been received.

The Wheat Commission has now under consideration further By-laws dealing with claims for deficiency payments and payments in advance on account of deficiency payments, the issue of wheat certificates and other matters connected with these aspects of its administration. Steps will be taken in due course to bring to the notice of all persons concerned the provisions of these By-laws and the procedure to be followed by registered wheat growers and by agricultural merchants so as to ensure that the growers shall secure deficiency payments to which they may be entitled under the Wheat Act.

The quota payment which millers and importers of flour are to make to the Wheat Commission is 10·8 pence per cwt. (2s. 3d. per sack of 280 lb.) on the output of flour. The anticipated supply of home-grown millable wheat for the cereal year 1932-33 is prescribed as 19,800,000 cwt.

* * * * *

DURING the two years 1930 and 1931 there were 16 international conferences, primarily concerned with the world's wheat situation or having wheat as one of the principal subjects of discussion. An interesting account of these conferences is contained in a brochure,* published by the Food Research Institute, Stanford University, California. Certain of the conferences concerned only the agrarian states of Eastern and Central Europe, which have suffered severely from the depression of wheat prices during the last two years, and have continually been seeking some means of alleviating their position. Others, notably the conferences held at Rome, March 26-April 2, 1931, and at London May 18-23, 1931, covered a wider field.

The European agrarian states have repeatedly urged that the chief wheat-importing countries should adopt a plan of European preferences giving advantage to the former states. After a number of preliminary conferences this proposal was placed before the Assembly of the League of Nations in September, 1930. It was not unnaturally opposed by representatives of overseas wheat-exporting countries. The idea

* Stanford University Wheat Studies, Vol. VII, No. 9. (London : F. S. King & Sons, Ltd. 1931.)

continued to play an important part in subsequent discussions, notably at Bucarest in February, 1931, and at Paris in the same month. At these conferences, however, proposals based on the allocation of certain quotas in favour of the European agrarian states gained support, and a resolution in favour of such a procedure was adopted at the Paris Conference, held under the auspices of the League of Nations Commission of Inquiry for European Union.

The conference held in Rome at the invitation of the International Institute of Agriculture represented 48 wheat-importing and exporting countries, and was concerned with the world wheat situation as a whole. The main result that emerged from it was the passing of a resolution urging that a meeting of representatives of the principal wheat-exporting states should be called to "formulate a plan on an international basis for the exportation of the 1931-32 crop." The conference foreshadowed in this resolution was held in London in May, 1931, and the principal question before it was the possibility of organizing an international export quota plan amongst the wheat-exporting countries of the world. Although a majority of the delegates present supported the plan, it was found impossible to reach unanimity. The conference ultimately decided to establish a committee for the purpose of submitting to the Governments of the participating countries a proposal for establishing a clearing house for information for the use of wheat-exporting countries, and for exploring avenues for the greater utilization of wheat. The brochure should be of value to students of the world's wheat position.

* * * * *

THE following note has been contributed by Mr. H. C. Long, B.Sc.(Edin.): The Lesser Broom-rape (*Orobanche minor* Sutt. (Sm.)) is one of the most trouble-

Broom-rape some parasitic weeds of the farm, as it attacks clover and other plants and may do great harm if it becomes established. During the past four or five years reports of the occurrence of this parasite in clover fields in East Anglia would seem to indicate that it is there becoming more abundant. In some other districts it is apparently less injurious than formerly.

This Broom-rape usually, but, perhaps, not invariably, behaves as an annual, and is a leafless, brownish root-parasite; the base of the stem is somewhat tuberous and scaly; the stems are generally stoutish and scaly, 6 in. to nearly 2 ft. in height, and usually occur singly; and the reddish, purplish

or yellowish-brown flowers open from June to October, and are crowded in a long spike (see coloured plate). The plant is attached to the clover roots by means of suckers (*Aemulorhiza*), and subsists on the food material elaborated by the clover for its own use. Sometimes the Broom-rape may be so plentiful that the clover crop is practically destroyed.

The dust-like seeds of Broom-rape are produced in considerable quantity, but being so small are readily removed from clover seeds, in which they are practically never found—indeed, they have never been found in clover samples examined at the Official Seed Testing Station, Cambridge. There is thus little fear of introducing the pest with clover or “seeds” sown. Broom-rape ripens its seed earlier than red clover, and the seeds are readily scattered by the wind, while they are probably also distributed from field to field when second-cut clover hay from an infested crop is fed to stock at the farm buildings or in the open, e.g., sheep at fold.

The seeds of Broom-rape only germinate on coming into contact with the roots of the clover or other “host” plant, and, as the seeds are clearly very rarely sown with the clover, it is probably for this reason that Broom-rape frequently appears only in the rows of drilled clover, and not between the rows—thus giving rise to the impression that they have been sown with the clover.

Among the means of controlling Broom-rape the chief are thorough hand-pulling of the plants before the flowers are open; the omission of clover for a rotation, so that it is not grown on an infested field until after the lapse of a number of years; the encouragement of the growth of the clover by the judicious use of fertilizers; and the exercise of care to ensure that clover or clover hay from a crop infested with Broom-rape bearing ripe seed capsules shall not be used in such a way as to distribute the seeds to fresh fields. Before an infested crop is cut the plants of Broom-rape should, if practicable, be pulled up by hand and burnt, and this is of the utmost importance if they have ripened their seed.

Any reader of this JOURNAL may obtain a copy of an illustrated leaflet on Broom-rape (Advisory Leaflet No. 120) on application to the Ministry.

Description of Coloured Plate.—A. *Orobancha minor*; B. *O. minor*, the inflorescence grown out; 1, bract; 2, calyx and pistil; 3, corolla laid open; 4 and 5, anthers (1 to 5 enlarged); 6, seed, nat. size; 7, seed enlarged; 8, fruit of Red Clover (*Trifolium pratense*), nat. size; 9, the same enlarged; 10, seed of Red Clover, nat. size; 11, the same enlarged.



BROOM-RAPE (*Orobanchaceae* Nutt.)

Mr. JOHN GILMOUR, Minister of Agriculture and Fisheries, received a deputation on June 14 from the Trades Union

**Deputation on
Rural Housing,
Wages and
Hours of Labour**

Congress General Council on the questions of Rural Housing and Wages and Hours of Labour in Agriculture. The Minister was accompanied by Earl De La Warr (Parliamentary Secretary to the Ministry), Mr. A. Ernest Brown, M.C., M.P. (Parliamentary Secretary, Ministry of Health), Mr. A. Noel Skelton, M.P. (Parliamentary Under Secretary for Scotland), and Major A. J. Muirhead, M.C.; M.P. (Parliamentary Private Secretary to the Minister of Agriculture).

The members of the deputation, which was introduced by Mr. W. Thorne, M.P., were as follows:—

Representing the Trades Union Congress General Council:—

Mr. C. T. Cramp, Mr. W. Holmes, Mr. Walter M. Citrine (General Secretary), Mr. Milne Bailey.

Representing the National Union of Agricultural Workers:—

Councillor A. E. Monks, J.P., Alderman G. E. Hewitt, J.P., Mr. H. B. Pointing and Mr. A. C. Dann.

The deputation put before the Minister the following resolutions passed at the Bristol Trades Union Congress in September, 1931:—

Rural Housing

"In view of the insanitary condition, insufficient accommodation and generally low standard of agricultural cottages, and the evident indifference of local rural authorities to the urgent need for new building, this Congress calls upon the Government to set up a National Rural Housing Board, empowered to deal immediately with rural housing upon a national plan that will ensure at least 100,000 new cottages of a satisfactory type and character being built to let at rents within the farm workers' ability to pay."

Wages and Hours of Labour in Agriculture

"This Congress views with grave concern the continuous efforts being made to reduce the wages and increase the hours of work of agricultural workers. It declares that the present wages are far too low to ensure a reasonable standard of living, and that to increase the hours of work is a retrograde step that will not remedy any present difficulties in the industry.

"Congress regrets that the Government has so far taken no adequate steps to protect the workers' interests, and urges them to introduce legislation for the re-establishment of a National Wages Board with full powers to revise local rates and establish wages above the sweated level.

"Congress further calls upon the Government to declare that no further monetary assistance will be given to the industry without a guarantee that reasonable wage rates will be maintained."

Councillor Monks and Alderman Hewitt on the question of rural housing, and Mr. W. Holmes on the question of wages and hours of labour in agriculture, amplified the statements

in the resolutions and emphasized the need for steps to be taken to improve the condition of the agricultural worker. They urged that the Government should take action on the lines indicated in the resolutions.

Mr. Ernest Brown, M.P., who replied on the question of Rural Housing, said that the need for economy was necessarily the overriding consideration at the present time, but, nevertheless, a considerable amount of work was being done throughout the country, and more progress had been made with rural housing development than was generally recognized. He urged that the fullest possible use should be made of the Housing (Rural Workers) Act of 1926.

On the question of Wages and Hours of Labour in Agriculture, Sir John Gilmour said that he was strongly of opinion that if real progress was to be made in agriculture the fullest possible co-operation between all partners in the industry was essential. The Government had endeavoured to apply this principal throughout all its activities and had, for example, arranged for the inclusion of a member of a workers' organization among the Wheat Commission and of two representatives of Labour among the advisers to the United Kingdom Delegation to Ottawa. The machinery of the 1924 Wages Act was being administered by the present Government on the same lines as by previous Governments, and in his opinion the position of the worker would not have been improved by the existence of a Central Wages Board. He dealt with some aspects of the agricultural wages position, and said that in his view the welfare of the agricultural worker necessarily depended upon an improvement in the condition of the industry as a whole, to which end the Government was directing all its efforts.

* * * * *

THE Minister of Agriculture and Fisheries and the Department of Agriculture for Scotland announce that, in pursuance of the powers conferred on them by

Fertilizers and Feeding Stuff Section 23 of the Fertilizers and Feeding
Act, 1926 Stuffs Act, 1926, they propose to make new
 Regulations to replace the Fertilizers
 and Feeding Stuffs Regulations, 1928,
 dated May 23, 1928. It is proposed, also, to bring the new Regulations into operation on September 1, 1932.

Copies of the Draft of the new Regulations can be obtained from His Majesty's Stationery Office, Adastral House, Kingsway, W.C. 2, or 120 George Street, Edinburgh; or through any bookseller, price 10d., post free 11d.

A SCHEME is in operation under which a limited number of young agriculturists from Denmark are afforded facilities to live and work for a few months on farms **Exchange Scheme** in this country in order to study, at first **for British and** hand, the methods and practice of British **Danish** agriculture. Similar facilities are available **Agriculturists** for an equal number of British agricultural students on selected Danish farms. The students are required to pay their own travelling expenses and to undertake regular work on a farm for a period of from three to twelve months in return for free board and lodging ; no money is paid to them for their services. The National Farmers' Union assists in the selection of farms on which the Danish students can be placed in this country and also helps to obtain suitable British applicants for work and study on Danish farms.

In Denmark, the scheme is worked by a Bureau of Agricultural Travel under the Royal Agricultural Society of Denmark. This Bureau has organized, with the assistance of the Danish Foreign Office and the Legations in Copenhagen of the various countries concerned, a series of similar exchanges with other countries ; and the Bureau, each year, places a number of agricultural students of different nationalities with Danish farmers of high standing, on whose farms dairy farming in general, scientific economic feeding of dairy cattle, breeding of dairy cattle, general co-operation in production, buying and selling, and so forth, may be studied.

The exchange scheme affords to young British agriculturists a unique opportunity, at a very low cost, of gaining practical experience of the farming conditions in a highly organized agricultural country. Last year fifteen young men from this country visited Denmark under this scheme, and it is hoped that more will be forthcoming this year. Those who desire to go to Denmark for a period of six months or less under the scheme should arrange to go out either early in May or early in November.

In England and Wales agricultural students who wish to take advantage of the scheme should make application as soon as possible through the Principal of a College or Farm Institute (if they have attended either of such institutions), or through the Agricultural Organizer of the county in which they reside.

THE Fourth International Congress of Agricultural Education is being organized by the International Federation of Technical Agriculturists, under the auspices of the International Commission of Agricultural Education, and will be held at Rome in November next. The first Congress was held in Paris in 1900, the second at Liège in 1905, and the third at Antwerp in 1930.

The subjects for discussion include the aims, methods and organization of agricultural education, the improvement of country life and rural domestic economy. The minimum fee payable by agricultural institutions, associations, etc., sending official delegates is 250 lire. For private members the fee is 25 lire.

Further particulars may be obtained from the General Secretary, Organizing Committee of the Fourth International Agricultural Education Congress, Via Vittorio Veneto 7, Rome.

* * * * *

TWELVE years ago, the Ministry invited the late Professor T. B. Wood to prepare a small handbook describing a simple general method of working out rations for cattle, horses, sheep and pigs. The resultant *Rations for Live Stock*, a pamphlet of 40 pages, issued as Miscellaneous Publication No.32, proved so popular that six further editions have since been called for, and the publication now ranks as one of the fundamental guides to modern agricultural practice.

Each new issue has included a certain amount of additional matter, provided up to 1927 by the original author, and since then by Dr. H. E. Woodman of the School of Agriculture, Cambridge. For the 7th edition, just published as a Bulletin,* Dr. Woodman has prepared a table of mineral compositions of the common feeding stuffs, recalculated the manurial values of feeding stuffs on the basis of present prices, revised the sections dealing with the nutrition of farm animals on pastures and much of the tabular matter on composition and nutritive values, and added a short section on the feeding requirements of egg-laying poultry.

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* Bulletin No. 48, *Rations for Live Stock*, obtainable through any book-seller or from H.M. Stationery Office. Price 1s. net., 1s. 2d. post free.

MILKING-MACHINES

OF routine operations on dairy farms, milking makes one of the heaviest demands on time and labour. As a possible means of economizing in these directions, the development of an efficient method of mechanical milking has long engaged attention, but the average dairy farmer will probably be surprised to learn that the literature of these efforts dates back to about 1820. The methods and machines devised up to the beginning of the present century, however, were somewhat crude and definitely unsatisfactory; but, during the years immediately preceding the Great War, various makes of milking-machines were introduced with some amount of success. With the general shortage of agricultural labour in the War years, mechanical milking became a necessity on many farms, so that the number of machines installed rapidly increased. It was, therefore, opportune that Viscount Astor's Committee, inquiring into the Production and Distribution of Milk, should investigate the position and efficiency of milking-machines in this country. In 1919 the Committee published a comprehensive report on an inquiry covering 142 dairy farms, together with general information from makers and agents.

The general conclusions derived from this inquiry were that milking-machines were being used with success and were as efficient as average hand-milking, but that, in many instances, farmers would prefer good hand-milking if and when good milkers were available. Where the machines proved unsatisfactory, it was suggested that lack of proper supervision, mechanical defects and unhygienic conditions were the main causes; and, for these reasons, it is, even now, not an uncommon experience to find milking-machine installations that have been lying derelict since the War period.

Recent Research.—During the last 10 years, much attention has been given to milk production generally, and, as part of the research and propaganda in connexion with better milk-production, mechanical milking has received renewed attention. In 1924, milking-machines, installed at the National Institute for Research in Dairying, were kept under daily observation, and a report was issued by Mattick and Proctor on their hygienic aspects. The report of a survey undertaken by the International Institute of Agriculture in 1927 was included in the *International Review of Agriculture*, 1929, and this stated that mechanical milking was widely practised

throughout Europe and was particularly adaptable to family farms, since it permitted greater production of milk per acre. During 1928-29, the Agricultural Machinery Testing Committee issued reports on two machines, both of which had passed severe tests satisfactorily, while a third machine is at present under test. In Scotland, M'Candlish and Cochrane studied the efficiency of milking-machines used by members of Milk-Recording Societies, and, in 1930, issued a comprehensive bulletin covering the whole subject of mechanical milking and the general hygiene involved. In Wales, Phillips and Thomas, of Aberystwyth, studied a machine on the College Farm, Nantcellan, over a period of two years and confirmed the results obtained at other centres, in addition to providing definite costings information.

Present Inquiry.—With the general fall in the price of agricultural produce, the relatively high cost of labour and restrictions on the normal hours of working, it is not surprising that the general investigations referred to above attracted considerable interest among milk-producers. It was felt desirable, therefore, to ascertain the present position of mechanical milking among members of the Milk-Recording Societies in England and Wales, and an inquiry was carried out, during the summer of 1931, by means of a questionnaire, submitted through the Ministry's Live Stock Officers working in conjunction with local societies. Information was obtained regarding the type of machine, the size of herd, time taken to milk the herd, the number of milkers, the technical procedure followed, and the general efficiency, economy and hygiene of the machine.

The results indicate that machine-milking was carried out in 373 milk-recorded herds in England and Wales, and that, with the exception of about 15 machines, all had been installed since 1924 and more than one-half during 1929-31. This number, however, represents only about $7\frac{1}{2}$ per cent. of the total milk-recorded herds. The average size of the herds was 36 cows, compared with a general average of about 23 cows for all recorded herds. This indicates, as one would expect, that machines had been installed to a greater extent in the larger herds. It is interesting to note that the parallel Scottish inquiry gave a general figure of 13 per cent. with a herd average of 64 cows.

The following figures indicate the rapid increase in mechanical milking during the last few years :—

No. of machines installed during	1910-24	..	..	15			
"	"	"	"	1925	..	..	9
"	"	"	"	1926	..	..	26
"	"	"	"	1927	..	..	50
"	"	"	"	1928	..	..	65
"	"	"	"	1929	..	..	87
"	"	"	"	1930	..	..	87
"	"	"	"	1931 (part year)	..	..	30

NOTE.—The date of installation of four machines is not available.

Almost all the machines in use were of the single-unit type, owing, no doubt, to the general utility of this type and to the need for recording individual yields.

The machines were in general use throughout the year, and were driven either by standard petrol or paraffin engines or by independent motors. About 22 per cent. of the machines were driven by electricity as compared with less than 6 per cent. in 1918. Heavy-oil Diesel engines were used in a few instances, and the low running costs may lead to an increase in this type of motive power. The adoption of electricity as an alternative source of power is a wise precaution, since a breakdown in the source of power would lead to serious difficulties on many farms. The h.p. usually varies from $1\frac{1}{2}$ to 7 or 8 h.p., and it is obvious that the heavier engines are used for other purposes than driving the milking plant; but it would seem that, on general principles, it would be an economy to instal an engine of low horse-power to be used solely for the milking-machine.

General Utility.—It may be assumed that the majority of herds concerned supply milk to the liquid milk market, and, as such, are governed to a great extent by available transport and the requirements of retail dairies. It is not surprising, therefore, to note that the average time of milking is relatively short, i.e., $1-1\frac{1}{2}$ hours, and in some cases even less than one hour. It is here that the value of a machine becomes obvious, quite apart from the actual saving in labour. The returns show that a herd of 30-35 cows can be milked by 2 men, or a man and a boy, with 3 units, in $1-1\frac{1}{2}$ hours. To do this by hand-milking would require at least 4 milkers or would take 2 to $2\frac{1}{4}$ hours with only 2 milkers. It is of particular advantage, during the rush of seasonal work, to be able to complete milking in a relatively short time, especially in view of overtime rates of wages. The time-factor is also important in maintaining the average quality of morning and evening milk.

As one would anticipate, in the case of smaller herds no appreciable saving is reported, but in herds above 60 cows

there is a clear saving of about 40 per cent. in man-power during milking. Producers, with herds of between 25 and 50 cows, estimate a saving in labour equivalent to $1\frac{1}{2}$ -2 men, although the range is extremely wide, varying from *nil* to 60 per cent., but such figures apply to the milking period only and not to the total labour charge of the farm.

Detailed figures, obtained by Phillips and Thomas at Aberystwyth, for a three-unit machine, milking 30 cows, indicate a running cost of slightly less than £1 per week, equivalent to 2 additional men for milking purposes only. On the other hand, a machine involves additional time for cleaning, compared with hand-milking, without reducing appreciably the general preparation of the cows; hence it would seem that the replacement of 2 milkers in the case of 40-50 cow herds, and $1-1\frac{1}{2}$ milkers in the case of 25-40 cow herds, is roughly equivalent to the additional costs of running the machine. It would appear, however, that when questions of milking efficiency and the effect of the machine on the yield and general constitution of the herd are considered, efficient machine-milking has many points in its favour.

General Routine.—Hand-stripping was generally practised, giving an average of $\frac{3}{4}$ lb. per cow with variations from $\frac{1}{2}$ to 4 lb. It was generally accepted that hand-stripping was advisable, as it ensured daily examination of individual udders and avoided undue strain on the delicate udder muscles. Similarly, when the daily yield dropped to 2-3 lb. it was the usual practice to dry off by hand. With few exceptions, the cows took readily to the machine, particularly the heifers, and there was no appreciable effect on general yield, although a few exceptional extremes were noted in the reports.

It was generally agreed that mechanical milking was preferable to average hand-milking, but inferior to a really efficient milker. Whilst many producers merely stated that a cowman could maintain and operate a machine, the more specific replies indicated that a high standard of intelligence was necessary. It must be remembered that machines cannot do everything; the human element enters largely into the success or otherwise of any mechanical farm operation. It was the practice in some instances to give a wage well above the average and to encourage interest and efficiency in other ways. The makers of the machines usually provide an after-sales service, and this has, doubtless, served a valuable purpose in ensuring continued satisfaction.

From the milk-recording aspect no difficulties arose in 80

per cent. of the installations, and as regards the remaining 20 per cent. the only drawback referred to was the fact that a little extra time was involved, no doubt because hand-stripping was the usual practice.

Cleansing.—One of the fundamental factors on which efficient machine-milking depends is that of cleanliness, and much attention has been given to this aspect during recent years. Research and experiments indicate that, with due care and correct procedure, milk of a high standard can be produced continuously. It is interesting to note, therefore, that wide variations existed in the time taken for daily cleansing of machines. A typical estimate was half an hour daily, and, in addition, two hours once a week, which would indicate a somewhat casual treatment after each milking, and total dismantling, cleansing and sterilizing at regular intervals. Individual times ranged from over 3 hours to less than 15 minutes, both of which point to some form of inefficiency. The work at Reading has enabled a definite technique to be fixed for daily and periodical cleaning, and it would seem advisable for some users to approach the National Institute for Research in Dairying for information and guidance on this point.

Adverse Factors.—A few herds have changed from daily to weekly recording since machines were installed, and, with 48 herds, mechanical milking has been replaced by hand milking. The reasons for this change vary, but are usually due to intensive udder troubles, a reduction of the herd, economy in small herds, loss in yield and inefficient labour. Perhaps the only cause worthy of note is that of udder trouble, taking the form of congestion and/or Mammitis (Garget). Congestion is usually due to faulty manipulation, whilst Mammitis can often be detected and checked in its early stages by examination of the fore-milk and the hand-milking of infected cows, or, at least, by leaving them for machine-milking until the remainder have been finished, and by strict attention to the hygiene of milk-production.

Conclusions.—This general inquiry has served a useful purpose in providing details of milking-machines on a large number of farms, and in confirming the general impression that mechanical-milking can be generally efficient and on many farms a definite economy. The Scottish inquiry indicated that little economy could be effected in herds below 40 cows, where wages were relatively high, or in herds below 60 cows with a comparatively low wage rate. The lower average figure

in England and Wales points to the general utility of a machine, quite apart from a purely cash economy, and shows that it is useful where local labour is limited or of doubtful efficiency, where the farm is run as a family unit and where general farm work, special contracts and regular delivery are important considerations.

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SEVEN YEARS' PIG-KEEPING

A STATISTICAL RECORD

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Pigs have been kept on a fairly large scale at the Hertfordshire Institute of Agriculture since November, 1921, and records are available in some detail for the period from April 1, 1923, to March 31, 1930. This article deals with the breeding and financial results during that seven-year period.

General Organization and Policy.—Pig-keeping at the Institute is organized as a separate department under the charge of a full-time stockman. From 10 to 20 sows have been kept during the period under review, and, with few exceptions, pigs bred have been sold off the premises either for pork or for bacon, but mainly for pork. During the dry period the breeding sows run on rough woodland pasture with shelter sheds, but are brought up to farrowing pens a week or a fortnight before farrowing. These pens are in an old grass orchard and each is about one-quarter of an acre in area. In each pen is a wooden hut for farrowing, and

shelter, and usually the sows have farrowed in these huts at any season of the year. The young pigs remain with their mothers for approximately eight weeks, and so are kept outdoors for that time. As soon as possible after weaning they come into a fattening shed, but in spring and summer may remain outside longer.

The special object until the spring of 1928 was to produce pork, but thereafter a number of pigs were fed to bacon weight. There is a good local demand for pork pigs weighing about 120 lb. live weight, and a bacon factory is situated about 18 miles distant. Good facilities for the disposal of stock have undoubtedly had a helpful influence on the pig department.

The breeding stock have consisted of Middle White, Large Black, Wessex and Cross sows, the two first-named breeds predominating in the earlier years, and Wessex and Cross sows in the latter part of the period. These sows have been 'crossed with Middle White boars for pork production and Large White boars for bacon production.

During the seven-year period there have been two outbreaks of swine fever, one in March, 1924, and the other in November, 1929. In the first outbreak 1 sow and 27 store pigs died, and with the consequent dislocation of the department it is estimated that the cash value of the loss due to this outbreak was approximately £150. During the 1929 outbreak, 3 sows and 29 store pigs died and the loss directly due to swine fever is estimated at £170. After the 1924 outbreak pigs were kept on under normal conditions, but after the one in 1929 it was decided to clear off all the pigs and rest the premises, and by March 31, 1930, the end date of this review, only 11 pigs were on the farm.

Management Routine.—The method of housing the breeding stock has already been mentioned. During the dry period and during pregnancy, the sows are given dry meals at the rate of about 4 lb. per head per day; when suckling, the meals are soaked and the quantity given is regulated by the apparent requirements of the sow, but goes up to 10 or 12 lb. per day. The actual ration has varied from time to time, but is normally based on the following proportions: 60 per cent. middlings, 30 per cent. barley meal, 10 per cent. fish meal.

Fattening pigs are housed in a shed which first became available in the summer of 1925, and which, extended by 4 pens in 1929, now provides accommodation for about 80 pigs. Before the shed was available, the fattening pigs

were housed in covered straw yards, which, although probably excellent for large hogs, have many drawbacks for young weaners. The feeding of the fattening pigs is done on a basis of age and weight, and the ration, given wet, is made up in the following proportions for porkers, with modifications for pigs carried to bacon weight: 30 per cent. middlings, 60 per cent. barley meal, and 10 per cent. fish meal. If potatoes are available, they are used as a part substitute for the meals. Damp and cold are guarded against by providing boards for the pigs to lie on, and by lining the roof of the shed with straw during severe weather. Treatment for worms is given as considered necessary and the pigs and their pens are kept clean.

Control of Feeding Stuff.—As the proportion of food cost to total cost is especially high with pigs, care in the use of feeding stuffs is likely to have a good effect on financial results, and special attention has always been given to this matter on the Institute farm. The pigman fills in a requisition note for all the foods he requires for seven days. This note shows the various classes of stock and the amount of food required for each, and enables the management to keep a fairly close check on consumption, without preventing the pigman using his discretion in feeding individual animals.

Personal Attention.—Although it is not possible to quote figures in support of the effect of personal attention, all observers are agreed that the four stockmen who had charge of the pigs during the period met with varying degrees of success. With the same allowance of food, one man would show pigs in better bloom and sows in better condition at weaning time than another. It may be impossible to measure results, but close attention or lack of it may have a considerable effect on the balance sheet.

Farrowing Results.—The following table shows the number of sows farrowing in each year, the number of pigs born *alive* and healthy, and the annual average. The term "pigs born alive" refers to pigs actually kept for rearing.

Year	No. of litters	No. of pigs born alive	Average per litter
1923-24	15	121	8.0
1924-25	33	211	6.4
1925-26	33	291	8.8
1926-27	33	298	9.0
1927-28	35	337	9.6
1928-29	38	343	9.0
1929-30	26	222	8.5
Totals ..	213	1,823	8.56

Of the 213 litters, 44 (20·7 per cent.) were from gilts with their first litter.

In the following table the same information is given from the breed point of view, as far as the records make this possible :—

Breed of sow	No. of litters	No. of pigs born alive	Average per litter
Middle White	44	312	7·1
Large Black	33	283	8·6
Wessex ..	36	365	10·1
L.B. × M.W.	39	389	10·0
W. × M.W.	6	63	10·5
Not described	55	411	7·5
Totals ..	213	1,823	8·56

Several points of interest arise from these two tables. The 213 litters have been obtained over 7 years from an annual average number of sows of 15·7, thus giving an average of 1·93 litters produced per sow per annum. The ideal aimed at by breeders is two litters per annum and this figure almost reaches it.

The average number of pigs born alive and meant to live has been 8·56 per litter. This figure, although weakly pigs and very early deaths are excluded, may be compared with the average of 9·32 per litter obtained in the East Anglian Pig Rearing scheme from 226 litters in 7 herds in 1929-30, and with the 7·1 per litter obtained by the Midland Agricultural College (1921-29). Falling intermediately, it may be regarded as above the normal for many farms, and if, as is freely stated, the ideal litter is 10 to 12 piglings, there is obviously need for accurate information on the factors limiting litter size.

The litter average for 1924-25 was very low, only 6·4, partly owing to the after-effects of the swine fever, for, during the two months succeeding the outbreak of March, 1924, many young pigs were born dead.

The analysis of the litters according to breeds, shows that the results from pure Middle White sows were disappointing, and that Wessex sows and crosses have reached the ideal ten. As a result of experience in the past, Wessex sows now predominate in the herd, and this policy is justified by the tabulated figures. The average litter from Middle White and Large Black sows together is 7·85 compared with 10·1 for pure Wessex sows—a ratio of 100:129. The number of pigs born per sow per year is 15·0 against 19·5, indicating that under the conditions on this particular farm Wessex sows produced 30 per cent. more pigs per annum than the average production of both Middle White and Large Black sows.

Mortality among Suckers.—The previous tables include only pigs that were born alive and fit to live ; the table below shows the mortality in suckers between farrowing and weaning :

Year					No. died	Percentage of total born alive
1923-24	..	..	..	..	17	14
1924-25	..	..	..	..	17	8
1925-26	..	..	..	..	66	22
1926-27	..	..	..	..	39	13
1927-28	..	..	..	..	24	7
1928-29	..	..	..	..	18	5
1929-30	..	..	..	..	18	8
Totals	..	..	..	..	199	11

Apart from the year 1925-26, the mortality figures do not appear to be high, and the main causes of death were crushing by sows and general debility. In the spring of 1926 many suckers died from an unknown bacterial disease while under veterinary supervision ; this is the main reason for the high mortality in that year, while it also had some effect on the figures for the succeeding year. The average death rate of 6.66 per cent. for the last three years compares very favourably with the 14.25 per cent. rate for the first four years.

Disposal of Suckers.—The total number of pigs born alive during the seven-year period was 1,823, of which 1,624 or 89 per cent. were weaned and transferred to the fattening shed or kept for breeding purposes. Account must, however, be taken of 32 suckers on hand at April 1, 1923, and of 19 suckers that were sold (10 in 1923-24 and 9 in 1928-29) ; this gives a total of 1,637 weaned suckers.*

The following stock reconciliation statement shows the position clearly :—

Valuation, 1923	..	..	32	Deaths	..	..	..	199
Births	..	..	1,823	Sales	..	..	..	19
				Transferred to—				
						Stores	1,611	
						Sows	24	
						Boars	2	
							—	1,637
								1,855

Thus 1,611 suckers were transferred to the fattening pens, 24 were kept for breeding purposes as gilts, and 2 were kept as boars. The two last mentioned were not weaned for stock

* Allowing for the death of one of the 32 suckers shown in the valuation.

purposes, but were sold. Of the 1,823 pigs born alive and fit to live, 1,625 were weaned or an average of 7.63 per litter. The comparative figure from the 1929-30 East Anglian Report is 7.96, but this is for pigs six weeks old.

Sows and Boars.—At the commencement of the period, 11 sows and gilts were on hand, and during the period 18 were purchased and 24 were home-bred. The mortality of the seven years was 6, 45 were sold, and 2 remained on the premises at March 31, 1930. Of the boars, 1 was in stock at the opening of the valuation, 7 were purchased, 2 were bred, 2 died, and 8 were sold. Causes of death among breeding stock were swine fever, cast womb, endocarditis and gastritis. Sows and boars were sold fat for one or other of the following reasons: age, poor litters, and inability to nurse litters.

Sales of sows were swollen owing to the clearance of stock effected in the autumn of 1929, 17 being disposed of in the year 1929-30. If that year be neglected, the average annual wastage in sows through death and disposals is approximately 6 or 38.2 per cent. of the average number of sows.

Store Pigs.—The following table shows the number of stores that died and were sold in each year:—

Year	Deaths	Percentage deaths	Sales	Total
1923-24	.. 39	20	152	191
1924-25	.. 15	11	122	137
1925-26	.. 14	7	198	212
1926-27	.. 31	13	200	231
1927-28	.. 24	10	220	244
1928-29	.. 18	5	350	368
1929-30	.. 39	12	291	330
Totals	.. 180	10	1,533	1,713

Of the total number of stores, approximately 10 per cent. died between weaning and sale. Of these losses, swine fever was responsible for 3 per cent., and a variety of diseases, including paralysis, debility, tuberculosis, pneumonia, erysipelas were said to be responsible for the remainder.

The reconciliation of the store pigs is as follows:—

Valuation, 1923	.. .. 8	Deaths	.. .. .. 180
Purchases	.. .. 105	Sales	.. .. 1,533
Bred..	.. .. 1,611	Valuation, 1930	.. .. 11
	<hr/> 1,724		<hr/> 1,724

All the purchases were made during the first year of the period. Of the 1,533 stores sold, 98 were sold as small stores,

the prevalence of which adds so considerably to the risks of pig keeping. From a breeder's point of view there can be nothing but satisfaction at the average of 9 to 9.6 piglets born alive and intended to live in the three years 1927-29, or of the still higher average of 10 to 10.5 from pure Wessex and Large Black and Wessex cross sows. These sows have produced so many more pigs that the only conclusion to draw is to select for productiveness and by further selection maintain a high standard.

With regard to the mortality of suckers the contrast is provided in the loss of only 6.66 per cent. in the three years 1928-30 compared with 14.25 per cent. in the preceding four years. The explanation is partly due to the incidence of disease, and to management. With stores the loss has varied from 5 per cent. to four times that proportion.

These wide variations emphasize the need for systematic recording on commercial farms to measure the problems and reduce the losses.

Undoubtedly, the outstanding lesson to be drawn from all the figures given is that careful and accurate recording of every event on a pig farm, or many pig farms, is necessary to sort out causes and effects and to determine which breeds excel and what is comprised in the term "good management."

Financial Results.—While breeding results affect success or failure, only financial results tell the true story of profit and loss. Cost accounts* have been kept on the Institute farm since April 1, 1923, and the following notes are based on the information they contain about the pig department.

The following account covers the whole period of seven years :—

PIG ACCOUNT, 1923-1930

	£	s.	d.		£	s.	d.
Valuation, 1923 ..	134	0	0	Sales ..	6,444	4	9
Manual Labour ..	826	12	9	Service Fees ..	26	5	0
Horse Labour ..	39	17	4	Manurial Residues	466	14	3
Purchase of Stock ..	484	2	0	Valuation, 1930 ..	27	0	0
Foods : Home grown	760	2	10	Experimental			
Milk ..	76	6	1	Account ..	191	0	0
Purchased ..	3,971	13	6				
Implements, depreciation	95	0	5				
Establishment ..	201	1	4				
Veterinary ..	83	0	5				
Sundries ..	60	0	5				
Net Profit ..	423	6	11				
	£7,155	4	0		£7,155	4	0

* This JOURNAL, April, 1929.

Excluding the opening valuation the total expenditure has been £8,597 17s. 1d., made up as follows :—

	£	s.	d.	
All Labour Charges	1,067	11	5	16.2 per cent.
Renewal of Live Stock	484	2	0	7.3 "
Purchased Foods	3,971	13	6	60.2 "
Home-grown Purchased Foods and Milk	836	8	11	12.7 "
Veterinary Charges	83	0	5	1.3 "
Implements Depreciation	95	0	5	1.4 "
Sundries	60	0	5	.9 "

As is generally recognized, feeding stuffs account for by far the greater proportion of the total cost, and steps that can be taken to reduce this proportion, such as the use of alternative foods, or a general lowering of feeding stuffs prices (as in 1930-31), would have a good effect on the profit and loss statements. The home-produced foods have been charged at cost of production, and are mainly barley, potatoes, and a very small quantity of separated milk. A usual figure given for food costs is 75-80 per cent. of the total cost, and consequently the 72.9 per cent. shown above is considerably below the normal. It is very near the 72.6 per cent. shown for farm No. 16 in Report No. IX issued by the Department of Economics, Wye. Commenting on this farm, Wyllie states that "the comparatively low percentage for foodstuffs on Farm 16 is suggestive of the very careful system of feeding which is in operation on this farm, not only for pigs, but for all other stock."

The system of feeding by control also shows in a favourable light when viewed from another standpoint. For every £100 spent on feeding stuffs the total cash sales were approximately £135, as compared with £104 and £129 obtained in the Cambridge investigations for the less successful and more successful farms respectively.

Apart from foods the only other appreciable cost is for labour, which accounts for 16.2 per cent. of the total. This includes all direct manual and horse labour and a proportionate charge for overhead expenses, the greater part of which is manual labour. It should be noted, however, that there is a credit of £191 for experimental work. This mainly represents manual labour, and if it is deducted the percentage cost due to labour falls to 13.3 per cent. In the Wye investigations already quoted, the average percentage due to labour over six years and all farms was 13 per cent. with an annual figure ranging from 9.7 to 15.3 per cent. Where individual figures are given for four farms the labour percentage varies from

11.4 to 18.5 per cent. The proportion of costs due to labour in the present investigation may therefore be regarded as reasonable, but accurate information regarding the best economic units in pig keeping is lacking, and further investigation appears to be called for.

On the income side, cash sales have brought in £6,470 9s. 9d., or just over 98 per cent. of the cash expenditure, and the profit shown is therefore dependent on the credits for manurial residues and for experimental work. The former credit can be justified by the large expenditure in feeding stuffs and represents an allowance of just under 10 per cent. on all foods used or of under 12 per cent. on purchased foods alone; the credit for experimental work amounts to just over £27 per annum, and represents the extra work involved in weighing and recording which would not normally be done on a commercial plant.

On the seven years working there is a total profit of £423 6s. 11d., and the incidence of profits and losses has been as follows :—

	Profits			Losses		
	£	s.	d.	£	s.	d.
1923-24				191	13	9
1924-25				25	19	3
1925-26	76	18	4			
1926-27	311	11	1			
1927-28	22	9	4			
1928-29	38	6	11			
1929-30	191	14	3			

These figures show wide variation and illustrate clearly the "ups and downs" of the pig trade.

It is unfortunate that the year 1930-31 was one of enforced idleness, as there is little doubt that had it been possible to carry on as usual the financial results over an eight-year period would have shown a considerable improvement over the seven-year one.

The heavy loss incurred in 1923-24 was due to the fact that many stores were purchased in that year and had to be disposed of when the price of fat pigs had fallen. In 1926-27 the substantial profit of £311 11s. 1d. was obtained through good prices for pigs and reasonably low food prices, and the profit in 1929-30 was achieved, despite the swine fever, owing to the very brisk demand and good prices for pigs in the autumn and spring of that period.

In the foregoing accounts, no mention is made of rent or interest on capital. The farm rent charge is an item in the cost of the home-grown foods. It is not easy to estimate the capital involved, for no detailed figures are available, but an

approximate estimate of the value of the equipment is : Implements, £140 ; huts, £100 ; fattening sheds, £250—a total of £490.

To this must be added working capital, approximately £500, making a total capital investment of practically £1,000. When allowance is made for interest on this capital at five per cent. the net profit for the seven years falls to £73 6s. 11d., or just over £10 per annum. On the average, therefore, the pig department on this particular farm has paid, but only by a small margin.

Conclusion.—The details given indicate a low return from pig-keeping, and further information is urgently required to eliminate weak links in management.

A litter average of 6.83 pigs reaching maturity does not appear satisfactory, and if this is a normal figure—and there is every reason to believe that it is not a low one—then investigations are necessary to trace where the weakness lies. Is it a question of breed or type, or both ? Experience on the Institute farm indicates that breed is not unimportant, but within the same breed sows give varying results. The need for breeding records is clear.

Is there a weakness in our knowledge of the management of young pigs till weaned ? A mortality of 11 per cent. is probably not unusual. The same question can be asked of the next stage, weaning to maturity. Further investigation in management, and also in the incidence of disease, seems called for.

Finally, can control of foods be carried further to ensure an economic use of food on the basis of weight for age ?

CHICORY-GROWING IN ENGLAND

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IN the article, "The Cultivation of Chicory," published in the issue of this JOURNAL for February, 1915, it was stated that the United Kingdom had relied chiefly on Belgium and, to a less degree, Germany for its supplies of chicory. The table accompanying that article gave the figures for the total imports of raw, i.e., unroasted, chicory for the years 1911, 1912 and 1913. In the year 1913, a total of 86,432 cwt. of raw chicory, representing a value of £37,083, was imported. These figures did not take into consideration the amount of prepared, i.e., roasted and ground, chicory imported (which, in 1913, amounted to 4,460 cwt.), nor the quantity imported already mixed with coffee, with regard to which nothing definite was known.

There seems to be a general opinion that the coffee-drinking habit has made considerable headway during recent years. As is well known, chicory, when roasted and ground, is used for mixing with ground coffee beans, and this preparation finds a ready market in the restaurants, hotels, and amongst the general public. It is used similarly by the manufacturers of prepared coffee essence for which there appears to be a very considerable market. The most recent figures available, those for the year 1930, show that the importation of chicory has not declined very appreciably and that we still rely largely upon the Continent for our supplies. In that year, a total of 70,771 cwt., valued at £35,120, was imported. In addition, 57,196 lb. of roasted or ground chicory, valued at £682, were also imported. Reckoning an average yield of 10 tons per acre, and taking into consideration the fact that roughly two-thirds of imported chicory is "single dried," it is estimated that our imports of this commodity were maintaining, approximately, 1,580 acres in cultivation on the Continent.

Chicory has been grown in Great Britain, notably in Cambridgeshire and Yorkshire, for a good many years. The growth and general productivity of the crop in the Eastern Counties of England are excellent in every way, and are regarded as equal in all respects to those obtained on the Continent. Provided adequate attention is given to the technique of drying the roots, the home-grown product is regarded as superior to the imported article and commands very favourable prices in the market.

A decided impetus has been imparted to home chicory-

growing by the formation, in 1930, at St. Ives, Huntingdonshire, of a company known as Chicory, Ltd. This company's activities are concerned with the cultivation, drying and marketing of the crop. The crop is secured by means of contracts placed with local farmers and smallholders, and the drying is carried out by the company at a modern kiln that was erected close to the town of St. Ives. Although the company was formed only in 1930, considerable progress has already been made, and the area under cultivation of the crop through the company's contracts was more than doubled in 1931. An average yield of from 10 to 12 tons per acre has easily been obtained, several growers raising up to 16 or 17 tons. In this connexion, it is worth noting that in Belgium yields of from 15 to 20 tons per acre are not unusual.

Soil.—The crop has been successfully grown on a variety of soils ranging from the light, gravelly land of the St. Ives district to the black, peaty deposits of the Cambridgeshire fens. The roots from the fens, although tending to run larger and coarser, with a higher water content, nevertheless yield a product indistinguishable from that grown on other soils. From the standpoint of drying-kiln management, however, it is considered desirable not to mix the crops from various types of soil and, as far as practicable, they are kept separate.

As a generalization it might be said that the ideal land for chicory is a deep, sandy loam with a clay fraction high enough to give it body and render it moisture holding. Because of the impediment offered to the harvesting and handling of the crop, a heavy clay soil is not so desirable. Although the Boulder clays of Cambridge have been found to grow chicory quite well, they present this one drawback, which would be very pronounced during a wet lifting season. The fen lands are probably the easiest formations on which to grow the crop on account of their high natural fertility and the facility with which such soils are worked and their crops harvested.

Rotation.—The place of the chicory crop in farming rotation appears to be of no importance, it being possible to follow almost any crop and also follow it with any crop. With proper attention to the cultivation and manuring of the land good crops of chicory could successfully be grown for two or three seasons on the same land.

Varieties.—There are two varieties of chicory of importance. These are "Dunkerque" and "Palingkop." The variety known as "Smouters" was formerly very popular on the

Continent owing to its heavy yielding powers. It is, however, of such inferior quality that the Belgian chicory dryers have made concerted efforts to stop its cultivation. The Dunkerque is the variety chiefly grown in England. It forms a shorter but thicker root than Palingkop and possesses high quality when dried.

Preparation of the Land.—The general preparation of the land for chicory follows roughly that usually practised for sugar-beet. Although the crop may successfully be grown on some types of soil, notably fen land, without organic manure, it responds to the application of dung, the use of which is imperative on the lighter gravelly or sandy soils. A fair dressing would be 12 loads (15-cwt. loads) well-rotted manure to the acre. As with sugar-beet the preparation of a good seed bed is important, hence the value of getting the land ploughed in good time, i.e., in the late autumn or early winter according to its nature. The reploughing of the land in spring is not advocated, land so treated tending to lie hollow with a resultant poor seed bed. The ploughing should be done well, a deep working of the soil being very necessary to ensure good results. The land should be ploughed at least 6 in. deep, and if a "pan" is present it should be subsoiled. Good chicory cannot be grown on close-bottomed, shallow worked land. Care should also be taken to select clean land, that is, land free from perennial weeds such as couch grass, thistles, docks, etc., and this applies particularly when following a cereal crop. It is useless to expect chicory to succeed in foul land.

At the end of March, the land should be well harrowed and rolled and be worked up into a fine, well-consolidated seed bed. At the same time, an application of 2 cwt. of superphosphate and 1 cwt. of sulphate of potash per acre should be broadcast and lightly harrowed in. On the lighter soils the sulphate of potash should be increased to $1\frac{1}{2}$ cwt. Where no dung was applied to the land these quantities of fertilizers should be increased by 50 per cent. and $1\frac{1}{2}$ cwt. of sulphate of ammonia should be added.

Sowing.—Provided that a good seed bed has been prepared the seed may be sown at any favourable time, i.e., when the surface soil is in a dry, friable condition, from April 15 to May 10. The seed must not on any account be sown more than half an inch deep, or the germination, which is very rapid, may be seriously retarded or the seed itself

will be destroyed. Very shallow sowing is an important point with the chicory crop and should on no account be disregarded. The seed is drilled, and experience has shown that the best spacing between the rows is from 12 to 16 in., using from 3 to 4 lb. of seed per acre. After sowing, the land should be rolled with a light smooth-faced roller. On heavy land the roller should be used with discrimination to avoid forming a crust. No advantage is to be gained by sowing earlier than the dates mentioned; on the contrary, seed sown earlier tends to produce a high percentage of "bolters," or plants that run to seed in the first year and are useless for the production of roots.

After-cultivation.—Probably the most important cultural operation in chicory growing is singling of the crop. In fact, the success of the crop will largely depend on this work. If it is neglected, or badly done, singling will not only result in a large proportion of small roots—which are not required by the drying factory—but the cost of lifting will be correspondingly increased.

As soon as the seedlings are well through the ground, with the third or fourth leaf showing, the land should be horse-hoed to stir the surface soil, destroy weeds and encourage growth. From a fortnight to three weeks later the crop should be hand hoed and singled. In the Hunts chicory-growing district it is not uncommon for gangs of men to do this job as piece work. Good work is worth from £3 to £4 per acre, and where neglect has occurred and weeds are abundant as much as £5 per acre may have to be paid. Neglecting to carry out the singling work at the right time will undoubtedly raise the cost of growing chicory, besides jeopardising the success of the crop. The plants are singled by hand, and experience has shown that chicory will be most successful when spaced 9 or 10 in. apart in the rows. It is useless to try to avoid the expense of singling by drilling the seed thinly. Such practice does not pay.

Hoing should be continued as required to keep the crop free from weeds. About a fortnight or three weeks after singling the plants will be greatly benefited by an application of a nitrogenous fertilizer. Experience has shown that this is best applied in the form of nitro-chalk at the rate of $1\frac{1}{2}$ cwt. per acre.

It is advisable to pull up and remove all "bolters" as soon as they can be detected, as such plants are useless and only rob the land.

Harvesting.—The chicory crop is ready for harvesting as soon as the roots have reached a size large enough for the factory's purpose. This will depend on the rate of growth obtained, which in turn depends on the type and general fertility of the land, cultivation, rainfall, etc., but under favourable conditions harvesting may be commenced from about mid-September onwards. As a rule the factories plan to start about the end of September, and continue as long as supplies are available, but the crop is usually all out of the ground by the middle of September. Generally speaking the frosts normally experienced during October or November will not do any material damage to the roots if these are out of the ground and stored in heaps, but during spells of severe frost the heaps should be afforded some protection by covering with straw or other material.

The general practice is to lift the crop by hand, using forks, and it is usual for this also to be done as piece work, £5 per acre being a normal price. For this the worker has to lift the roots, taking care to see that they are removed whole, screw off the tops by hand and pile the roots in heaps convenient for carting. On very light soils and on the fen lands harvesting has been successfully done by means of a sugar-beet lifter, but, generally speaking, hand lifting with forks is the accepted practice. The main point is to guard against damaging the roots, which must be delivered to the factory in good condition and free from cuts and bruises.

Drying.—The roots are washed clean at the factory in specially-constructed, rotary washing-machines, after which they are passed through a slicing machine which cuts them into cube-like pieces. The freshly-cut pieces are then drawn up to the top of the kiln and spread out on the first of a series of drying floors. The heat for drying is obtained from coke ovens at the base of the kiln, the hot air from these passing through a series of perforated floors to exits at the top of the building. As the drying proceeds each batch of chicory is turned over with wooden shovels every two hours to prevent scorching, and in turn shovelled down on to the floor below, until at the lowest floor (that nearest the fires) the drying is completed. It is reckoned that it requires from 4 to 5 tons of fresh chicory to yield 1 ton of "single dried" chicory. The "single dried" chicory still contains a slight amount of moisture, from 12 to 15 per cent., and although it is marketed in this condition a proportion of the chicory imported from the Continent has usually been "double dried" by a special

process, the main object being to remove superfluous weight. Double "dried" chicory will store for a longer period in good condition than the "single dried."

Actually the technique of chicory drying is not a simple one, and experienced management of the kiln is required to ensure that a product of the right quality is turned out. When the drying is completed the chicory is bagged up in hessian bags which are weighed and sewn up ready for dispatch; if it is not required the chicory is emptied from the bags into a heap in a dry warehouse, where it remains until dispatched to the roasters and coffee blenders.

Cost of Cultivation.—As with all root crops the expense of hand labour contributes largely to the cost of growing chicory. From inquiries carried out by the writer in the St. Ives district the approximate cost per acre of growing this crop is as follows:—

	£	s.	d.
Rent and other land charges	2	0	0
Ploughing and harrowing (2 horse land)	1	0	0
Dung: 12 loads (15-cwt. loads) at 12s. 6d. a ton carted and spread on land	5	12	6
Fertilizers, including application	1	10	0
Seed and drilling	0	15	0
Hoeing and singling	4	0	0
Harvesting, i.e. digging	5	0	0
Carting to factory (motor), 12 tons average, 5 miles radius of factory	2	0	0
TOTAL	£21	17	6

- N.B. 1. Where no dung is applied to the land there would be a corresponding reduction of costs.
 2. Tractor ploughing would also be slightly cheaper.
 3. No item is included in the above for depreciation of implements or management.
 4. The annual value of good fen land is at least 50 per cent. higher than that quoted above.

The cost of growing crops in Great Britain tends to vary considerably from farm to farm. The chicory crop has been likened to that of the sugar-beet crop which, in cultivation detail, it closely resembles; but whereas the sugar-beet grower has to contend with the important marketing factor of sugar content in addition to the question of total weight of roots per acre, the chicory grower is concerned only with the latter. It has already been stated that the weight yields may be as high as 17 tons per acre under favourable conditions. Under unfavourable conditions and under imperfect systems of cultivation the yield may easily be as low as 7 tons per acre. The range of yields open to the grower is therefore a wide one, and it is necessary only to add that, in common with all root

crops, it does not pay to stint expenditure on growing a chicory crop.

This account of chicory growing under present conditions indicates that the crop may be profitably grown in Great Britain under the existing position governing imports. At present the industry enjoys a substantial measure of protection from foreign competition, and the growers are able to obtain remunerative prices for their crops.

The development of this industry in the early days was favoured by fiscal conditions, since the imported chicory, from August, 1836, to August, 1853, had to pay a duty of 20s. per cwt. on kiln-dried chicory. In August, 1853, the duty was reduced to 4s. per cwt., and entirely abolished in October, 1854.

The withdrawal of the import duty on chicory in 1854 was a blow to the home industry, but almost before it had become accustomed to production and trading under unprotected conditions, chicory again came under the notice of the Chancellor of the Exchequer. In 1860, a Customs duty of 6s. per cwt. (kiln-dried) on imported chicory was levied; this was increased to 12s. per cwt. in 1861, and further increased until it stood at 39s. 8d. per cwt. in 1922. In that year, the duty was reduced to 26s. 6d. per cwt., and, in 1894, it was further reduced to 13s. 3d. per cwt. At the present time, imported chicory from foreign sources still pays a duty of 13s. 3d. per cwt. on the kiln-dried article, or 2d. per lb. on the roasted, while the duties levied on chicory of Empire origin are 11s. 1d. and 12s. 3d. respectively. The excise duty, which at one time (1864) stood as high as 24s. 3d. per cwt., had fallen to 10s. per cwt., when it was finally removed in August, 1926.

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MILK DEFICIENT IN SOLIDS-NOT-FAT AN INVESTIGATION ON A HERD OF COWS IN HAMPSHIRE

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DIFFICULTY in keeping the solids-not-fat content of milk above the implied "standard" of 8.5 per cent. is experienced by many farmers in different parts of the country. In most instances, the cows are fed on properly-balanced rations, and rarely is there any apparent cause for the deficiency. For this reason, a series of experiments was carried out with a herd in Hampshire to discover whether, by the addition or substitution of certain foods, the solids-not-fat content could be improved.

In the district where these experiments took place, there existed a general belief that, where green food formed part of the winter keep, there was seldom any trouble with a low solids-not-fat content. It was decided, therefore, to test the effect of feeding kale to some of the cows in place of the man-golds given to the rest of the herd; also, in case there should be any deficiency of vitamin A or D in the winter dietary, it was arranged to add a small quantity of cod-liver oil and malt to the ration fed to another group of cows.

The herd in question consists of about 50 pedigree British Friesians. The cows are of a good type, are well looked after, comfortably housed, and have always received an adequate amount of food. The soil of the farm is a medium loam lying on the chalk, the land being well drained and in quite good condition. The pastures carry a good crop of grasses and clovers, but the herbage is by no means luxurious. The cows are milked by machine, and thoroughly stripped-out by hand. The hours of milking are 5.30 a.m. and 2.30 p.m.

Samples of milk had been taken from the herd in April, 1930, when it was found that a large number of the cows were giving milk with a solids-not-fat content of under 8.5 per cent. The owner of the herd had in the past received numerous complaints about the low solids-not-fat content of the milk from his cows, and although he had tried a variety of foods, and had always used a properly balanced ration, he had been unable to effect any improvement.

The farm was visited once a week by the writer and a sample of milk was taken from every cow in the experimental groups at both the morning and evening milkings. The first visit took

place on October 28, 1930, and the last on March 24, 1931, making in all 21 visits.

All the samples were analyzed for fat and solids-not-fat. The fat was determined by the Gerber test; the total solids were found by evaporating the milk first on a water bath and then in a steam oven until a constant weight was reached.

There were 30 cows in milk at the end of October, which were expected to continue their lactation period until the end of March. After samples had been taken from the animals for three weeks, and the milk had been analyzed, they were divided into three groups each consisting of 10 cows, of approximately the same age, at similar periods in their lactation, and giving milk as nearly as possible equal in both quantity and solids-not-fat. Throughout the experiment, the ten cows in the control group continued in milk, while, in the other two groups, samples of milk were always obtained from at least eight animals.

The feeding was as follows.—

Group A. Control

14 lb. Seed hay.

7 lb. Oat straw.

30 lb. Mangolds.

3½ lb. concentrates per gal.
of milk.

1 per cent. steamed bone flour was added to the concentrates, and rock salt was provided in all the fields.

Group B.—Received the same food as Group A plus 6 oz. per head of cod-liver oil and malt.

Group C.—20 lb. kale were substituted for the 30 lb. mangolds fed to Group A.

Drinking bowls are in front of all the cows in the byres and water is laid on in the pastures.

Concentrates consisted of

40 per cent. Dairy cubes.

15 per cent. Palm-kernel cake.

15 per cent. Maize-gluten feed.

15 per cent. Oats.

15 per cent. Bran.

The cows were lying out at night until November 24, and, from that date until the end of March, they were only turned out for about five hours during the day. After the first three weeks there was very little grass. The mangolds and kale were first given on November 19. The kale lasted until February 15 and, after that date, the cows in Group C received the same ration as the controls. The cod-liver oil and malt was supplied by the National Malt Products Association, and was fed from December 2 until the end of the experiment.

Diagrams I and II show the weekly variation in solids-not-fat in the mixed milk of the cows in the three groups. It is apparent from these charts that there was no appreciable improvement in the solids-not-fat content of the milk of the cows receiving either kale, or cod-liver oil and malt, over that of the controls. After an initial drop due to several cows having

calved within a few days of the beginning of the experiment, the mixed milk of the 30 animals had an average solids-not-fat content of 8.1 to 8.2 per cent.

The number and percentage of samples from each group that had a solids-not-fat content of under 8.5 per cent. are shown in Table 1.

TABLE I

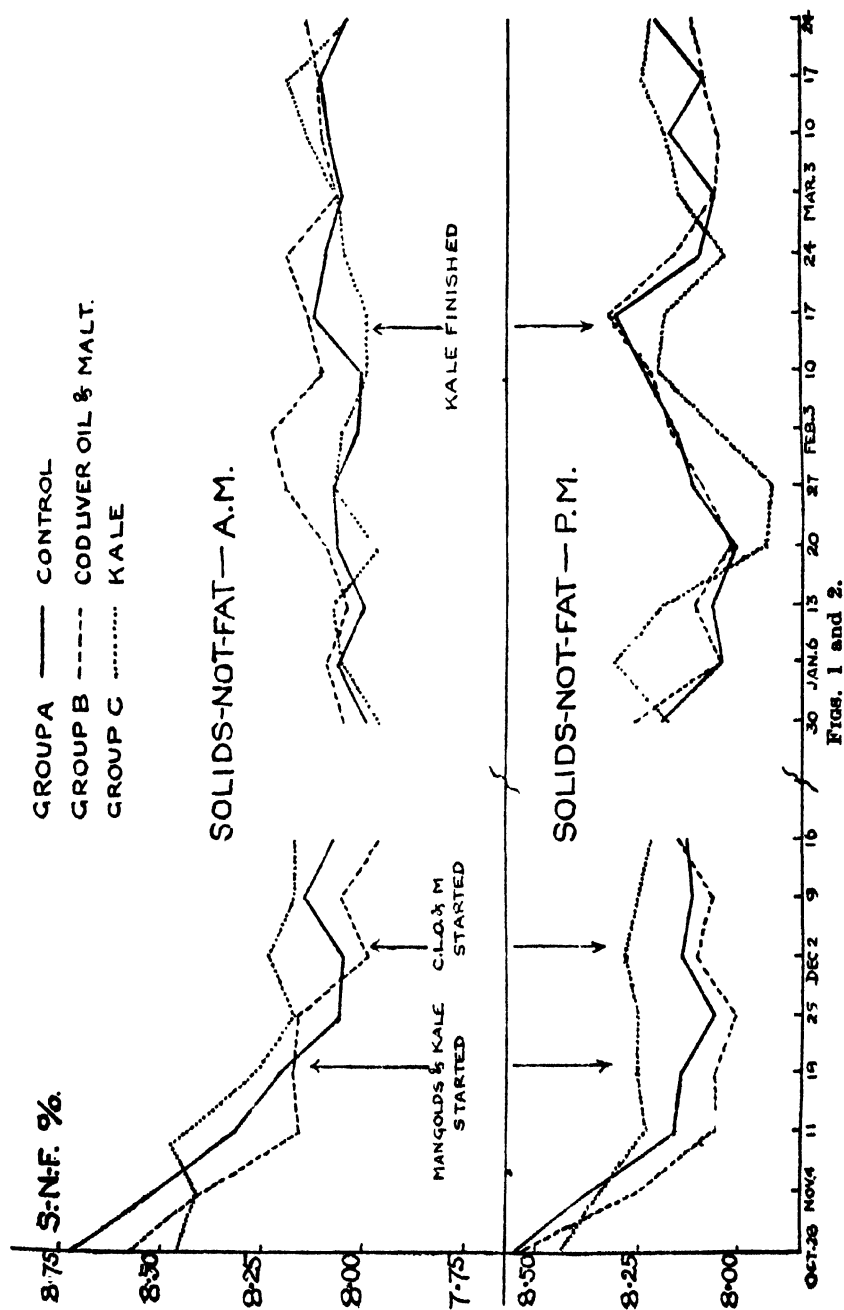
	Number of samples tested	Number of samples below 8.5 per cent. S.N.F.	Percentage of samples below 8.5 per cent. S.N.F.
Group A (Control)	420	329	78.3 per cent.
Group B. (cod-liver oil and malt)	414	320	79.5 ..
Group C (kale)	392	324	82.7 ..
Total	1,226	982	80.1 ..

During the investigation, the average daily milk yield of the cows in the experimental groups was slightly below $2\frac{1}{2}$ gallons per cow, and, although the total yields of the three groups fell off uniformly, the cows in the control group always gave most milk. The average milk-yield for the entire herd during the previous milk-recording year was 700 gallons.

The fat content of the milk of the three groups was practically the same. In the morning the average fat content of the milk was about 3.2 per cent., and in the afternoon just over 4 per cent. The mixed milk of the 30 cows in the morning always contained more than 3 per cent. of fat.

With two exceptions, the cows were in very good condition throughout the experiment. Nine cows, however, were suffering from a very mild form of mastitis in one or more quarters, but no correlation could be found between these infected animals and those giving the lowest percentages of solids-not-fat.

Extension Experiments.—In the main experiment, samples of milk were taken for the last time on March 24, 1931. The herd was, however, again visited on May 19, June 9 and June 30 to discover whether there was any improvement in the solids-not-fat when the cows were out on grass. Table II shows the solids-not-fat on these dates compared with the average during the main experiment and also with samples taken on March 24. These figures show that, when the cows were out on grass, the milk was considerably higher in solids-not-fat than when the herd was on winter feed. During May and June, samples were also taken from churns that contained the milk of the entire



herd and included the milk of a number of spring calvers. The solids-not-fat content of the milk from these churns was between 8.7 and 8.8 per cent. as compared with an average of about 8.15 per cent. during the winter months. On March 24 80 per cent. of the samples taken were below 8.5 per cent. solids-not-fat as compared with 26 per cent. on May 19 and 16 per cent. on June 30. It may be of interest to consider the variation in the solids-not-fat of the milk given by the cow Avro. The highest percentage of solids-not-fat given by this cow in the morning from January 1 to March 24 was 8.09 per cent., while it was 9.05 per cent. on May 19, and 9.44 per cent. on June 30, on which date she gave 17 lb. milk.

The above results point to the fact that the cows in this herd, with only a few exceptions, are capable of giving milk that is above 8.5 per cent. solids-not-fat and also that there is a marked rise in the solids-not-fat when the cows go out to grass. Although the foods given to these cows during the winter constituted a perfectly normal ration which contained sufficient amounts of starch and protein equivalents, according to present-day feeding standards, it is possible that the food may have been inadequate in some other respect.

TABLE II.—PERCENTAGE OF SOLIDS-NOT-FAT

Name of cow	Winter feeding			Cows out on grass					
	Average Oct. 28— Mar. 24	March 24		May 19		June 9		June 30	
		a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
Jade ..	8-23	8-25	8-46	9-08	8-87	9-18	9-04	9-77	9-37
Belle ..	7-78	7-69	7-91	8-19	8-13	8-14	8-19	7-80	7-71
Astral ..	8-67	8-48	8-70	9-06	9-04	9-21	9-18	9-32	9-04
Alison ..	7-97	7-86	7-95	8-11	8-14	7-69	7-68	dry	
Carmen ..	8-05	8-10	8-37	8-14	8-65	dry			
Adoration ..	7-85	7-65	7-69	8-51	8-53	8-44	8-25		
Butterfly ..	8-56	8-51	8-49	9-10	8-99	9-10	9-18	8-59	8-14
Dot ..	7-76	7-75	7-82	7-92	7-77	dry			
Marian ..	8-21	8-20	8-27	9-02	8-99	9-17	8-95	9-08	8-98
Delia ..	8-91	8-12	7-61	8-56	8-70	dry			
Brownie ..	8-41	8-38	8-55	9-12	9-15	9-50	9-44	9-73	—
Briarsweet ..	8-68	8-88	8-66	9-23	9-02	9-25	9-04	8-89	8-75
Aimée ..	8-40	8-22	8-53	8-89	8-83	9-12	8-78	8-69	8-93
Mavis ..	7-93	7-76	7-88	8-83	8-60	8-74	8-45	8-81	8-70
Avro ..	8-13	7-85	8-20	9-05	9-06	9-43	9-26	9-44	9-30
Blanche ..	8-59	8-67	8-67	8-95	9-02	dry			
Prude ..	7-54	7-36	7-72	7-83	7-86	8-36	8-25	dry	

More detailed analysis on the milk of this herd indicated that the chief deficiency in the solids-not-fat was due to a very low percentage of lactose, the other main constituents

being present in normal quantities. The low lactose was always accompanied by a high chloride content, and it was possible to calculate the lactose from the chloride with very close agreement. After the first two weeks, chloride determinations were made on all samples. It was almost always found that low solids-not-fat were associated with a high chloride content. During May and June when the cows were out on grass the chloride content of the milk returned to normal. This showed that when the solids-not-fat were up to normal there was no longer any deficiency of lactose in the milk.

Summary :—

- (1) A herd of 50 cows in Hampshire was known to be giving milk deficient in solids-not-fat.
- (2) The feeding of kale to a group of cows in place of the mangolds fed to the rest of the herd effected no appreciable improvement in the solids-not-fat content of the milk.
- (3) The addition of cod-liver oil and malt to the ration of another group also failed to raise the percentage of solids-not-fat.
- (4) Although the cows were in good condition and were fed according to modern feeding standards, the mixed milk of the 30 cows always fell below the "standard" of 8.5 per cent. solids-not-fat between November 4, 1930, and March 24, 1931, during which time weekly samples were taken.
- (5) The solids-not-fat in 80.1 per cent. of all the samples taken during the main experiment were below the "standard."
- (6) The low solids-not-fat were associated with an abnormally small quantity of lactose in the milk accompanied by a high chloride content.
- (7) When the cows were turned out to grass, the lactose content of the milk increased and the solids-not-fat returned to normal.

The writer wishes to express his thanks to members of the staff of the National Institute for Research in Dairying for their valuable assistance ; and the University is indebted to the Ministry of Agriculture for the financial help that made the investigation possible.

ANGORA RABBITS UNDER THE COLONY SYSTEM

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BETWEEN the years 1921 and 1927 the Angora wool industry, even in this country, was comparatively prosperous, all sections sharing in the prevailing boom. The price offered by British spinners for raw material of the best quality amounted at one time to as much as 40s. per lb., and the average over a number of years was in the neighbourhood of 35s. At these rates, comfortable profits were being made even by the newer recruits to the industry, whose technique and knowledge of rabbit breeding probably left much to be desired. Similarly, live stock dealers, as represented by Angora wool farmers and the fanciers, who prided themselves on being "the backbone of the industry," had little difficulty in disposing of their best and surplus stocks at prices that left a substantial margin over expenditure. It is, however, by no means certain that the breeders, pure and simple, profited more than the wool farmers who confined their activities to wool production for sale at the prevailing market rate. One of the most interesting and pleasing features of the boom period was the high quality of stock produced; and I well remember a show at Chelmsford, when over 200 rabbits passed through my hands, the percentage of high-grade Angoras being astonishing.

During 1928, however, the industry experienced a catastrophic slump. Spinners refused to accept wool from many wool farmers who, consequently, disposed of their stock at the earliest opportunity, and it was no unusual sight to see rows of Angora rabbits exhibited in shop windows for sale at ordinary carcass rates. First-class animals fetched no more than a few shillings per lb. weight. There was general regret, but the pity was that, within a comparatively short period, so much first-class breeding stock was lost to the country.

The real facts about this slump are only now beginning to be appreciated. It need not be assumed that breeders were entirely free from blame; they had had an opportunity to co-operate which was neglected, and a Joint Wool Council, established on their behalf, received no support. Their greatest error, however, was an assumption that spinners in this country were dependent upon British breeders and wool farmers for supplies of raw material. Wool producers had

been led to believe that the quality of British wool was so greatly superior to that of the French product that it would be in constant demand for all time, although it was hard to reconcile this belief with the fact that garments produced by the leading spinners, when examined, failed to reveal a preponderance of the fine-textured fibre that characterizes the British product. It was common knowledge that the price per lb. paid by British spinners for British wool was considerably higher than that given for the Continental product; but it is doubtful if those concerned realized that, in the event of a trade slump, the effects would be felt first and foremost by the breeders and wool producers in this country. This, in fact, is what actually happened. Supplies in France were still drawn upon, although the price fell even there, despite the assertion of breeders in this country that it was impossible to produce Angora wool of first-grade quality at less than 30s. per lb. In fairness to the spinners, it should be acknowledged that they continued, even during the slump period, to take supplies at this price from a selected number of British Angora breeders.

As a national industry, however, Angora wool production ceased to have any appeal. The lesson was obvious. British wool producers had been receiving preferential treatment on a scale that it was impossible to continue, and any hope of a return to the old conditions rested solely upon a revival of the boom in the section of the textile industry that deals with Angora wool. One had only to consult the Board of Trade returns, however, to see that, even at the worst period of the slump, French breeders, presumably through agents, continued to find a market for their wool in this country. This period of acute depression, however, gave some breeders opportunities for thinking out the possibilities of producing Angora wool at a price that could compete successfully with the continental supplies.

In no sub-division of live stock keeping is tradition ingrained so deeply as in rabbit-keeping, and there is probably no section of the population that is more difficult to convert to modern methods of mass production and rationalization than rabbit-keepers as a class. The "fancy" is not merely the backbone of the industry; it is its whole anatomy, and any idea or method that tends to alter the traditional structure is met with the sternest opposition on all sides. Nevertheless, some of us were convinced that the situation called for drastic measures, and that revolutionary alterations were needed

to place Angora wool production upon a sounder footing. To this end, at Preston Hall, we broke most of the canons of rabbit-keeping by an experiment, nearing the end of its third year, of which the details have been noted day by day since it was begun.

Briefly, we set out to diminish the cost of Angora wool production by effecting a reduction in the two main items of past expenditure—labour costs and feeding costs. It was decided to try and run together a large number of does, with one or more bucks, in an enclosure, and so save hutch accommodation during the period of gestation. At the end of the fourth week, the does were removed and placed in hutches. It came as a surprise that they did well in the colonies, and that, when removed to the hutches, the great majority kindled down a few days later in the usual way. When the progeny from these does reached the age of three weeks, they were removed with their dams to “miniature” colonies; here, again, we were surprised at the sociability of the animals. There was little or no fighting. When the weaning age was reached, the does were transferred back to the colonies, with bucks, for further breeding, and the young rabbits were set free in colonies by themselves until their third month, an age at which it becomes necessary to separate the sexes. The young does and the young bucks were then kept apart in different enclosures.

It will be realized at once that, in feeding alone, there was an immense saving in labour. In an enclosure for, say, 150 does, feeding simply involves emptying baskets of green food on the ground. The alternative, under the old method, would be to open 150 hutch doors, insert 150 lots of food and close 150 hutch doors. In our experiment the does lived together amicably and prosperously, no difficulties in management were encountered, and no more damage resulted than has been observed in a herd of gilts.

The young bucks have also been run in large numbers with complete success, but with the precaution of restricting each colony to bucks of approximately the same age. Young bucks do not mix well with old ones. If, however, 50 or 60 young bucks in one colony are allowed to grow up together, they give little trouble as a rule, although, when a quarrel does arise, it is usually more vigorous and prolonged than in a colony of does. This accords, of course, with experience in running young boars together. So long as they know each other, and the even tenor of their way is not disturbed by

strangers of their species, especially female strangers, complications rarely arise.

As regards the health of the animals, it is difficult to determine whether their greatly-increased stamina and vigour are due to the colony system or to the altered methods of feeding, which, as has been explained, were aimed at an economic target. No doubt, the additional exercise afforded by the colony system is a contributing factor, for it is safe to say that rabbits obtain more exercise in 24 hours of colony life than many do in a lifetime spent in a hutch. In the colonies, the appetites of the rabbits become insatiable and their gymnastic exercises are endless. Many interesting facts about the behaviour of the rabbit, that cannot be detailed here, have been learned from observation and experience with the colony system.

It has, however, been possible to effect greater economy in feeding than in labour. That green foods constitute the diet of choice for the rabbit is an axiom, and as green foods cost little or nothing more than the labour of collecting them, it was decided to make them the staple diet. With the exception of hay, green foods constitute the sole diet of over 90 per cent. of the Preston Hall stock for seven months of the year. An initial ration of half a pound of green food per day per rabbit proved unsatisfactory. The rabbits lost in weight and their eyes lost brightness. The ration was, therefore, increased, and, at the present time, each rabbit is receiving approximately 1 lb. of green food per day, taking all ages into consideration. Under this regime, the stock is in splendid condition—bright, alert and active; and the breeding stock is in better condition than I have ever known rabbits to attain.

The secret of this vitality doubtless lies not so much in the green food as in the manner of feeding it. It is invariably well mixed. It needs to be emphasized that there is a danger in feeding too much of the same plant to rabbits at any given time. Each species has its own active principle, and with many species a toxic dose may soon be reached. It must be freely admitted that much of the green food dietary at Preston Hall has been, necessarily, of an empirical nature, although, as regards both quantity and quality, it may be possible, as time goes on, to determine whether particular mixtures yield better results than the indiscriminate mixtures at present being given. No deaths from poisoning have occurred, and it may be inferred that rabbits can be trusted to extract "the

wheat from the chaff" when mixed green food is given to them.

There are now, at Preston Hall, a large number of rabbits running in an open-air enclosure well covered with grass, and it is a novel experience to see them grazing all day long like sheep or cattle. It leads one to suppose, however, that the ration of 1 lb. of green food per day is probably a minimum, for the does in the open-air colony, as regards growth and development, are in advance of the rabbits confined to indoor colonies.

The great reduction in labour costs, and the simplicity and low cost of feeding, have gone a considerable way towards lowering the production cost of a pound of wool. During the winter months, oats, bran, roots and hay are substituted for a considerable proportion of the green food, but it is estimated that, throughout the year, it is possible, taking foodstuffs alone, to produce 1 lb. of Angora wool under the colony system at a cost of 5s. Under the hutch system, it was estimated that the cost, in foodstuffs alone, of producing a pound of wool was round about 12s. With the colony system, grooming is unnecessary, and clipping of the wool, when it has reached a length of 3 in., is undertaken by one individual specially appointed for the work. It is estimated that he can clip 40 Angoras per day, or, on an average, 200 per week. Assuming, therefore, that he is clipping all the time, he can deal with a stud of 2,400 rabbits in a period of three months, at the end of which time the first rabbit clipped is due for a repetition of the operation. For this reason, the best unit under the colony system is probably one of 2,400 rabbits.

Originality is not claimed for the methods employed in this new phase of rabbit culture. They merely give practical application to an embodiment and development of time-honoured principles. At the same time, many sentimental traditions, including elaborate pedigrees, that have been constantly associated with the purely fancy side of the industry, have been jettisoned. Under the new system, it is felt that it will be possible to face possible fluctuations in the market with more equanimity, and that there will be a margin to meet a fall in price, so that we can escape the fate of the breeders who, during the slump of three years ago, were forced to dispose of their stocks.

CELERY-WASHING BY MACHINERY .

WITH the exception of carrots and perhaps to a small extent other root vegetables, no attempt appears to have been made, until comparatively recently, to wash celery and other vegetables by machinery. As a result, however, of team work by a firm of machinery manufacturers (Messrs. Gwynnes Pumps, Ltd., Lincoln), a celery grower and merchant, and the Horticultural Organizer for the Lindsey Division of Lincolnshire, a machine has been designed and manufactured for celery-washing.

Genesis of the Celery-Washing Machine.—Most of the celery grown in this country (on a total area of over 6,000 acres) is marketed in the unwashed state. Exceptions occur in certain instances of relatively small areas of production situated in, or near to, important consuming centres, but in such areas the celery (like certain other vegetables) is washed by hand.

It had been represented by the marketing committee of a local branch of the National Farmers' Union that, for celery marketed in the unwashed state, growers were receiving only a relatively small proportion of the price paid by consumers for celery in the washed state. The conclusion reached was that unwashed celery is not marketed, as a rule in a manner sufficiently attractive to secure anything like the support needed from the retail trade. The bundles of twelve or more heads are often sent to market in an extremely dirty condition ; and the practice of showing large heads on the outsides of the bundles, and packing small heads within, is, unfortunately, by no means uncommon. Celery so marketed falls below the standard of the progressive retailer who aims at maintaining in his shop a display of clean high-quality produce, attractively arranged. His sales of celery can generally be substantially increased if he offers it in the washed instead of the unwashed condition.

In the course of investigations, it was found that celery, when washed and wrapped in cellophane paper, maintained its freshness and crispness for an even longer period than when marketed unwashed and unwrapped. This discovery led to an experiment, carried out in 1930, in the marketing of washed celery. The roots and most of the leaves and top portions of the stems were removed, thus leaving the edible portion, which was then washed by hand, the water being delivered under pressure through a hose. After the excess moisture had been allowed to drain away, the celery was wrapped and packed in non-returnable crates. This washed product sold so well that the demand

very quickly outstripped the supply, and the price received was a satisfactory one.

It became obvious, however, that mechanical washing would be necessary, not only to effect the operation with greater speed and at less cost, but to make washing a practicable proposition to the grower or merchant handling celery on a large scale. After a period of experiment, the mechanical washing machine referred to was tried out last year with satisfactory results.

The Machine and its Operation.—Briefly, the machine consists in the main of a heavy spoked and rimmed wheel, 8 ft. in diameter, set on a vertical spindle so that it can revolve horizontally at a height of about 3 ft. from the ground. Round the outside of the rim is fixed a series of spikes and hooks in pairs, so placed that each pair will hold a stick of celery horizontally, these spikes and hooks being made of rustless steel to avoid any possibility of staining the celery. The heads of celery are attached to, and removed from, the wheel while it is being rotated at the speed required for washing, and the rotating of the wheel is carried out, almost automatically, by the man who places in position the trimmed heads of celery, which are then carried through a tunnel of sheet iron. Inside this tunnel is fixed a series of sprays in the form of horseshoes. The water pumped into the system is sprayed under pressure into the sides and hearts of each head of celery at different angles, the jets being so arranged that the force of the water assists the rotation of the wheel. The daily output of washed celery from such a machine represents not less than the produce of about half an acre. The makers state that the machine, in normal working, is capable of washing fifty heads a minute.

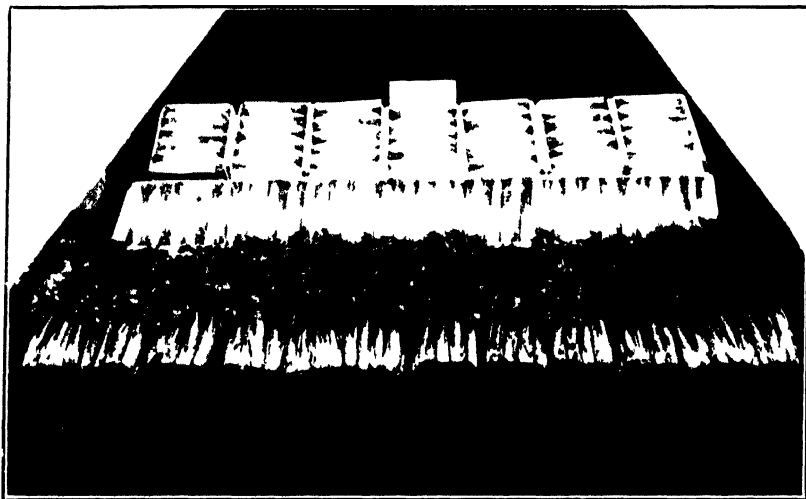
General.—It is almost certain that the system of marketing washed celery will develop, as the product is presented in a most attractive form. The waste portions and soil removed represent about 50 per cent. of the weight of unwashed bundles. Moreover, the washed and wrapped celery can be marketed with the assurance that, allowing for the normal time occupied in transit through the usual trade channels, it will reach the consumer in a fresh and crisp condition. The finished article has only to be seen to compel an admission that it is eminently suitable for retail display in the vicinity of other attractively-packed produce.





Another view of the Lyceum building in Washington, D. C., showing the entrance to the building which the heads, after
 termination of the first night of the attachment.





Bundles of dirty celery (in front) and the washed, wrapped and packed product (in the background)



Packages of washed and wrapped celery.

THE CONTROL OF WIREWORMS UNDER GLASS

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WITH the recent rapid developments in commercial horticulture in the British Isles, there has been a considerable extension of the area under glass. In many instances, glass-houses have been erected on grass land or land recently broken up from grass or ley; and, as a result, there have been serious losses from wireworm attack, since newly-broken-up grass land is usually heavily infested with wireworms.

Under glasshouse conditions, it is possible to deal with wireworm attack more efficiently than is possible under field conditions, and experiments by the writer* have shown that the use of an attractive bait, supplemented by the application of calcium cyanide as an insecticide, will give a high degree of control of wireworms under glass.

For a general account of the life history of wireworms and click beetles the reader should refer to the Ministry's Leaflet No. 10.

Wireworms in Glasshouse Soils.—Grass land usually contains four or five generations of wireworms. During the first year after grass land is broken up for market gardening or agricultural purposes the wireworms feed mainly on their customary food, the turfy matter. Those that reach maturity, and become click beetles in that year, appear to migrate to undisturbed grass land, and the wireworm population consequently decreases. During the second year, another series of wireworms reaches maturity and leaves the broken-up land, thus further decreasing the wireworm population. This goes on for four or five years, so that, ultimately, the wireworm population is reduced to a negligible number.

When, however, glasshouses are erected on turf or ley, or turf is introduced into glasshouses, wireworm infestation of a more or less serious nature follows. During the first season after the land is covered, the wireworms feed mainly on the turf, causing little harm to the crop plants, which are usually tomatoes, lettuce, beans, etc. A proportion of the wireworms reach maturity during this year, but many, unable to find their way out of the houses, lay their eggs in the soil of the

**Investigations on the Control of Wireworms.* Ann. App. Biol., Vol. XIV, 1927, pp. 359-387.

houses, and this tends to increase the wireworm population in the soil, or, at any rate, to maintain its number.

During the second year, much of the turfy matter which provided food for wireworms has been broken down, and, in the absence of this, the crop plants are attacked. Attack may become so intense that the crop is only established after continuous replanting, which entails loss of time and labour and results in a late crop and diminished yields. Under these conditions, some system of trapping is adopted, and growers use potatoes, carrots and cabbage stumps as traps; these traps are examined at frequent intervals and the wireworms collected and destroyed.

The struggle to establish a crop in the presence of serious wireworm infestation may go on for several years, and it is common to find that the first few years on new land, far from yielding an easy profit, show a substantial loss solely on account of this pest.

A Typical Case of Wireworm Attack under Glass.—The following account is fairly typical of wireworm attack under glass. An enterprising and thoroughly practical Lancashire grower built two glasshouses, Nos. 1 and 2, early in 1930. These houses, each 85 ft. by 50 ft., were planted up with 1,450 tomato plants per house. During the first season only 3 plants were lost from wireworm attack in No. 1, and only 4 plants in No. 2. In the autumn, after the tomato crop was removed, 12,000 plants of winter lettuce were set out in each house. Within a month, over half the plants, approximately 7,000, were destroyed by wireworms in No. 1, and the crop was completely destroyed in No. 2.

In the spring of 1931, the houses were again planted up with tomatoes, 1,450 plants in each house. Losses from wireworm attack began within three days after setting out, and, in the course of 11 days, about 500 plants, or about a third of the crop, were destroyed in house No. 1, while in the same period every plant was destroyed in house No. 2. The second house was replanted, and, by continually replacing attacked plants, about 700 plants were grown to maturity. In the two houses, with a total capacity of about 2,900 plants, only 1,700 plants, or a little over one-half, were established, and this only after continuous replanting.

Following the 1931 tomato crop, 1,000 French beans were planted in house No. 1 and 12,000 lettuces in house No. 2. The beans grew well until just after flowering, and then they were completely destroyed by wireworms, as many as 16

wireworms being found in a single stem. In house No. 2, wireworm attack was continuous, but, by dint of constant replacement, 2,000 lettuces, or a sixth of the possible crop, reached maturity.

Early in 1931, two more houses of similar dimensions were built and planted up with tomatoes. As with houses Nos. 1 and 2, loss from wireworm attack during the first year was negligible, only 6 plants out of 1,450 being destroyed in house No. 3 and 5 plants out of 1,450 in house No. 4. The plants grew late and no autumn or winter crop was taken in these houses.

In January, 1932, the two newer houses were planted with tomatoes, and losses from wireworm attack were immediate and severe. Over 7,000 plants were set out in house No. 3 to obtain a stand of 1,300 established plants by the end of March. In No. 4, the plants were totally destroyed within a week after planting. The house was replanted, and again more than three-quarters of the plants were destroyed.

This grower estimates the direct loss of crop from wireworm attack at a minimum of £500. Since wireworm injury was negligible during the first season, this heavy loss was incurred in four houses during the second year after their erection on grass land. It is interesting to note that the grower's records show that by constant trapping and forking over the soil of the houses he destroyed over 50,000 wireworms in houses Nos. 1 and 2.

Baits to Attract Wireworms.—A series of tests* showed that germinating seeds were the most effective baits for wireworms, the commonly-employed baits, like potatoes, carrots and cabbage, proving much less attractive. Bran also proved a good lure, drawing the wireworms very quickly, but the attraction was only transitory on account of the tendency for moulds to develop on it. Mixtures of bran and wheat or bran and oats also attracted the wireworms speedily and were efficient over considerable periods.

In ordinary circumstances, wheat or oats have proved very satisfactory in use. A moderately heavy seeding should be given on wireworm-infested soil, and, if the grain has been soaked overnight, it will attract the insects more quickly than when in a dry state. In suitable houses the grain can be drilled with a hand seed drill, otherwise drills must be made in the ordinary way and the wheat or oats sown 2-3 in. deep in rows 2-4 ft. apart, according to the intensity of the wire-

*This JOURNAL, Jan., 1927.

worm infestation. Generally, rows about 3 ft. apart are quite satisfactory. Some heat should be applied in order to secure rapid germination, and to encourage the wireworms to assemble in the upper layers of soil.

The wireworms begin to collect at the bait within a day or two after sowing, and examination of the bait rows will show how the baiting is progressing. Under satisfactory conditions, the maximum number of insects will have assembled at the bait rows in about a fortnight, and the calcium cyanide can then be applied. Where the houses are large enough to permit the use of a hand drill of the Planet Junior type, this may be used, but it is necessary to fit it with a deep plough attachment to deposit the cyanide granules below the bait, that is, at a depth of 3-4 in. If the cyanide cannot be applied in this way, the following methods may be adopted, but they are rather more laborious.

The hand drill may be used to open up a furrow along the middle of each bait row, and, subsequently, the drill run along the open furrow to deposit the cyanide, which must be immediately covered. This is not a good method, but it may be used in an emergency.

A third practical and very efficient means of applying the cyanide can be used when no hand drill is available. A spade may be used to cut a slit along the middle of the bait row and worked backwards and forwards a little to widen the slit at the surface. The cyanide may then be poured in from a tin, in the lid of which has been pierced a hole through which the granules are allowed to run. The capacity of the tin can be measured and the material applied at the appropriate rate. After the cyanide is applied in the bait rows, the opening should be firmly closed. When the cyanide application is completed, the ventilators should be shut and the house locked up for 24 hours as a precautionary measure, because fumes from the cyanide escaping into the air may prove dangerous to anyone entering or working in the house soon after the treatment.

Rate of Application of Calcium Cyanide.—Although the most efficient dressing under experimental conditions has proved to be about $1\frac{1}{2}$ lb. to 150 ft. of bait row, Table I shows results obtained with various dressings.

A Case of Successful Treatment.—Particulars of a serious wireworm infestation in a Lancashire nursery have already

TABLE I

Calcium cyanide (in lb.) per 150 ft. of bait row ..	$\frac{1}{2}$	1	$1\frac{1}{2}$	$1\frac{1}{2}$
Percentage of wireworms killed	64.28	78.26	83.45	94.11

been given. The grower was anxious to try the calcium cyanide treatment, and on March 10, 1931, after having lost the bulk of the first planting of tomatoes in house No. 4, he drilled wheat in houses Nos. 2 and 4. Each house accommodated 11 rows of bait a yard apart. On March 21, representative yards of bait were examined and the following data showed that the wireworms were assembling.

TABLE II

Yard length of bait row Nos.	1	2	3	4	5	6	7	8	9	10	11	12
Wireworms assembled :												
House No. 2	4	3	27	7	3	14	3	10	15	9	2	22
House No. 4	9	15	11	8	18	4	6	10	14	6	5	9

The grower was anxious to complete the planting of No. 4 with tomatoes, so the bait rows and the assembled wireworms were at once taken out and destroyed. On April 1, house No. 2 was treated with calcium cyanide, two untreated rows being left as check. 6 lb. of calcium cyanide were used for 216 yards of bait row, or 1 lb. for 108 ft. The house was then closed and left undisturbed until April 6, when representative yards of treated and untreated rows were examined. In the 12 yard lengths of treated bait row, 101 wireworms out of a total of 133 were found to have been killed by the cyanide. This is rather more than 75 per cent., a quite satisfactory kill. Details are given in the following table :—

TABLE III

[illegible]

Conclusion.—It is widely recognized that wireworms are a serious pest on recently broken up grass land, and experience has shown that the losses from wireworm attack in glasshouses newly erected on such land may be especially severe. Since wireworm attack does not usually appear until after the first crop has been taken in the houses, it would seem advisable to experiment with some bait rows in order to discover if wireworms are likely to be injurious to the subsequent crop. Where wireworms are present in large numbers, the method of baiting with germinating seeds, followed by the use of calcium cyanide, seems to afford a fairly simple and reliable means of dealing with the pest.

The writer is indebted to Mr. N. J. Macpherson, of the Lancashire County Horticultural Staff, for assistance in carrying out the demonstration in Lancashire, and to Mr. A. W. Plummer, of Warton, for valued co-operation.

* * * * *

MARKETING NOTES

The Draft Hops Marketing Scheme.—A scheme under the Agricultural Marketing Act, 1931, to regulate the marketing of English hops, was submitted to the Minister on March 8 last on behalf of growers of English hops. In accordance with the procedure laid down by the Act the Minister gave notice of the submission and fixed April 22 as the last day for receiving objections or representations with respect to the scheme. Objections were received from 25 persons or bodies, two of whom subsequently withdrew their objections. Arrangements were made for Mr. E. M. Konstam, C.B.E., K.C., to hold a public inquiry into the objections, and to report thereon to the Minister as required by the Act.

In the meantime, a grower of hops obtained in the King's Bench Division of the High Court a rule *nisi* to prohibit the Minister from proceeding with the Scheme. At the hearing of the rule *nisi* before the Lord Chief Justice, Mr. Justice Avory, and Mr. Justice Du Parcq, the rule was discharged with costs.

The inquiry into objections was opened on June 2 and closed on June 17.

National Mark Fruit : Roll of Packers.—The following have been added to the lists of authorized packers of National Mark fruit :—

TOMATOES

Essex :

W. J. Dodwell, Love Apple Nursery, Crooked Mile,
Waltham Abbey.

A. G. Harknett & Sons, Rosedale, North Street, Nazeing.

J. Hawker & Sons, Arnland's Nursery, North Street, Nazeing.

S. F. King, Fair View Nursery, Pilgrims Hatch, Brentwood.

R. H. Pinkerton, Lubard's Lodge, Rayleigh.

J. P. Smits, Hillside Nursery, Low Hill, Roydon.

E. Tullett, Bayhorne, Honey Lane, Waltham Abbey.

Mrs. A. Tucker, Sedge Gate Nursery, North Street, Nazeing.

Glos : H. J. Williams, Sheldon Nurseries, Tewkesbury Road, Cheltenham.

Hants : A. R. Wills, Tadburn Nursery, Romsey.

Herts : Taylor & Arnold, Hill View Nursery, Goffs Oak, Cheshunt.

Middlesex : H. Brown, 202 Durants Road, Ponders End.

Somerset : Kelways, Ltd., Langport.

Sussex : H. Anscombe, Bristol Nurseries, Kemptown, Brighton.

CUCUMBERS

Essex : Davies & Capp, Highfield Nursery, Crooked Mile, Waltham Abbey.

A. G. Harknett & Sons, Rosedale, North Street, Nazeing.

J. Hawker & S. Risk, Mead Gate Lane, Nazeing.

J. Hawker & Sons, Arnland's Nursery, North Street, Nazeing.

J. P. Smits, Hillside Nursery, Low Hill, Roydon.

E. Tullett, Bayhorne, Honey Lane, Waltham Abbey.

Mrs. A. Tucker, Sedge Gate Nursery, North Street, Nazeing.

Glos : H. J. Williams, Sheldon Nurseries, Tewkesbury Road, Cheltenham.

Hants : A. R. Wills, Tadburn Nursery, Romsey.

Herts : G. J. Robinson, Prospect Nursery, Nazeing Road, Broxbourne.

Sussex : J. S. Baker, St. Elmo, Goring-by-Sea.

STRAWBERRIES

Essex : F. & P. C. Clark, Little Totham, Maldon.

W. S. Dice, Tudwick, Tiptree.

H. G. Evans, Playhill, Hatfield Peverel.

H. H. Frost, Parsonage Farm, Tolleshunt Major, Maldon.

W. R. Griffiths & Sons, Mayland Fruit Farm, Mayland, Chelmsford.

C. Hicks, Lane's Farm, Hatfield Peverel.

F. King, Mill House, Great Totham, Maldon.

W. Lock, Great Braxted, Witham.

A. Marvon, Grange Farm, Wickham Bishops, Witham.

J. McLaughlan, Renter's Farm, Tolleshunt Major, Maldon.

R. Seabrook, Foundry House, Tolleshunt Major, Maldon.

E. Thompson, Sawyer's Farm, Tolleshunt Major, Maldon.

F. H. Williamson, Poyston, Tiptree.

Hereford : G. Jackson & Co., Glewstone, Ross-on-Wye.

Kent : G. Bates, Boughton Mount Farm, Maidstone.

A. Blundell, Otford Lane, Halstead.

L. J. Goodhew, 8 East Street, Sittingbourne.

F. Hatcher, Shatterling, Wingham, Canterbury.

W. E. Walton, Hazel Cottage, Halstead.

Norfolk : C. F. Larn, Alington, Norwich.

<i>Suffolk :</i>	B. J. Andrews, Heveningham, Halesworth. P. Andrews, Stone Cottage, Chediston, Halesworth. E. H. Bunning, Botesdale, Diss. E. Holmes, Mellshill Fruit Farm, Halesworth.
<i>Sussex :</i>	Maxey Fruit Co., Ltd., Fittleworth.
<i>Wilts :</i>	G. Reeves, Hawk Street, Bromham.
<i>Worce :</i>	Bakewell & Williams, Old Hill Farm, Grimley.
CHERRIES	
<i>Kent :</i>	S. H. Kemsley, Hayman's Hill, Horsemonden.
<i>Worce :</i>	Bakewell & Williams, Old Hill Farm, Grimley.

Apples and Pears.—The National Mark apple and pear scheme has now completed its fourth season of operation. Heavy and widespread attacks of scab interfered seriously with the development of the scheme last season, the output under the National Mark of many of the leading growers being thereby curtailed by some 50 per cent. The deficiency was, however, largely offset by the output of newly-enrolled growers, and, in consequence, the total National Mark output was only slightly below that of the previous season. A much larger output under the Mark is expected in the forthcoming season.

Plums.—The Council of the National Federation of Retail Fruiterers, Florists and Fishmongers recently passed unanimously the following resolution :—

"That this Council is pleased to know that the Ministry of Agriculture is carrying out what this Federation has advocated for many years, in fostering better grading and packing and better weights by applying the National Mark Scheme to agricultural produce, and wish the Ministry success in its efforts. At the same time we submit that, considering the advantages now enjoyed by home producers, standards of packing and grading, similar to those of the National Mark Scheme, should be made compulsory."

The following message has also been received from Mr. John T. Fitzpatrick :—

"In my capacity as President of the National Federation of Fruit and Potato Trades' Associations (Inc.) Ltd., I am pleased to state that this effort on the part of the Ministry to improve the manner of packing, grading, and presentation of English plums for market is one that should commend itself to the wholesale trade, and more particularly to the growers, to whom it offers the opportunity of placing their fruit before the public with a definite and recognized standard of grading."

Considerable interest in the scheme has been evinced by growers, especially in the Pershore district. Judging from the applications for enrolment already received, it is likely that a substantial proportion of the 1932 season's crop will be packed under the National Mark.

National Mark Canned Fruit and Vegetables.—The list of authorized canners has been further extended by the enrolment of Newbery Bros. (Battle), Ltd., of High Street, Battle,

Sussex. Several authorized canners have extended their existing premises or have built new factories that will operate during this season.

The list of varieties of fruits and vegetables approved for canning under the National Mark has been extended to include the following :—

Plums.—Magnum Bonum (syn. Warwickshire Drooper).

Cherries.—May Duke.

Apples.—Tom Putt.

Peas.—Canners' Perfection ; Dwarf Canner ; Charles I.

It has been decided that the minimum strength of syrup used in future in cans of *Select Dessert Cherries* shall be 35 per cent. instead of 45 per cent. by weight of sugar. It has been found that the number of sizes of *Select* peas packed under the National Mark varies considerably, and, with the approval of the National Mark Canned Fruit and Vegetables Trade Committee, it has been decided, for the 1932 season only, to permit authorized canners to adopt a pack of ungraded peas in addition to the size grades they already market. Cans containing peas ungraded as to size are required to be labelled "As from the pod."

National Mark Bottled Fruit and Vegetables.—The following firms have been authorized by the National Mark Committee to apply the National Mark to fruit and vegetables grown and bottled in England and Wales :—

- London :** Kearley & Tonge, Ltd., Mitre Square, E.C. 3.
Chas. Southwell & Co., Ltd., Bermondsey, S.E. 1.
Yeatman & Co., Ltd., Denmark Street, E. 1.
- Berkshire :** Co-operative Wholesale Society, Ltd., Coley, Reading.
- Bucks :** St. Martin Preserving Co., Ltd., Slough.
- Cambridge :** Wisbech Produce Canners, Ltd., Lynn Road, Wisbech.
Wisbech Produce Canners, Ltd., Ely.
- Cheshire :** The Silverpan Preserving Co., Ltd., Reddish, Stockport.
- Derbyshire :** M. Walker, Exeter Street, Derby.
- Glos :** Park Farm Preserves, Ltd., Park Farm, Winchcombe.
John Stephens, Son & Co., Ltd., Worcester Street, Gloucester.
- Hampshire :** The Hampshire Preserving Co., Romsey.
J. Long, Ltd., Testdale Works, Whitechurch.
- Hereford :** Herefordshire Fruit Co., Ltd., Mansion House, Hereford.
T. E. Davies, Webton Court, Madley, near Hereford.
Ledbury Preserves (1928), Ltd., Fairtree Preserve Works, Ledbury.
- Kent :** Wisbech Produce Canners, Ltd., Paddock Wood.
- Lancs :** Co-operative Wholesale Society, Ltd., Preserve Works, Middleton Junction, near Manchester.
The Wavertree Preserving Co., Ltd., Wavertree, Liverpool.
W. T. Mather, Ltd., Millingford Works, Golborne, Warrington.

- Lincoln :* Crosbie Pure Food Co., Ltd., Bradley.
J. & J. Beaulah, Ltd., Boston.
Lincoln Preserving Co., Ltd., Great Grimsby.
Wisbech Produce Cannery, Ltd., Spalding.
T. G. Tickler, Ltd., Great Grimsby.
- Middlesex :* T. W. Beach & Sons, Ltd., Hanworth.
Co-operative Wholesale Society, Ltd., The Steyne,
Acton.
T. G. Tickler, Ltd., Southall.
- Northants :* Joseph Farrow & Co., Ltd., Carlton Works, Peter-
borough.
- Oxford :* Frank Cooper, Ltd., Victoria Works, Oxford.
- Suffolk :* The Woodbridge Canning Co., Ltd., Hamblyng
Gardens, Woodbridge.
- Sussex :* L. Cook & Co., Ltd., Kingston-by-Sea, Brighton.
Newbery Bros. (Battle), Ltd., High Street, Battle.
- Warwick :* Greenwood Paige & Co., Ltd., Seville Works, Tyburn,
near Birmingham.
- Worcester :* T. W. Beach & Sons, Ltd. Evesham.
Vale of Evesham Fruit Cannery, Ltd., Badsey, near
Evesham.
Wisbech Produce Cannery, Ltd., Evesham.
- Yorkshire :* W. Field & Co., Ltd., Hull.
The Yorkshire Canning Co., Ltd., Hambleton, near
Selby.

National Mark Wheat Flour.—It is clear from inquiries that reach the Ministry that there are still large areas in which National Mark flour is unobtainable at retail shops. So many authorized millers now put up packs of the three grades—*Plain*, *Self-Raising* and *Yeoman*—in retail bags of the usual sizes that there should be no difficulty in any grocer or baker providing himself with supplies to meet his customers' demands. On the recommendation of the National Mark Wheat Flour Trade Committee, it has been decided, however, to introduce two further modifications of the conditions attached to enrolment in the National Mark Wheat Flour Scheme, to meet the cases of retailers who are reluctant to stock and sell the flour in bags except under their own names. (1) Any retailer may now make arrangements with an authorized miller to pack National Mark flour under the retailer's name, provided that either the official label bearing a serial identity number is affixed to the bag, or, if the National Mark is printed on the bag (under licence from the Ministry), the design of the bag is registered with the Ministry. (2) Grocers who do not handle sufficient quantities of National Mark flour to qualify for enrolment as authorized repackers may be able to take advantage of the concession now offered by the Ministry whereby recognized local grocers' associations may receive authorization under conditions which would permit the associations to delegate to their members the right to pack National Mark flour under their own names.

Publicity for National Mark Produce.—National Mark Shopping Weeks were held at Guildford and Eastbourne in association with the Ministry's marketing demonstrations at the Royal Counties Agricultural Show (June 1-4) and the Sussex Agricultural Show (June 22-23), respectively. Advertisements were inserted in the local newspapers, shop-window display competitions arranged for retailers stocking National Mark products, and short addresses illustrated by films given to senior school children by arrangement with the local Education Authorities. The local arrangements were undertaken by Committees consisting of representatives of traders' organizations, and the respective Mayors took an active part in stimulating interest.

At the Confectioners' and Bakers' Exhibition, to be held at the Royal Agricultural Hall, Islington, from September 3-9 next, the Ministry is offering three prizes of £10, £5 and £3, respectively, in the special class for 2-lb. Commercial Tin Loaves made wholly with all-English National Mark flour. Competitors must give a guarantee that the bread is made wholly from all-English National Mark flour, and that none of the other ingredients (yeast, etc.) is of foreign origin. They must also give an assurance that bread made from National Mark flour will be obtainable on application at their business premises and that such bread will actually be on show and on sale in their shops during the period of the Exhibition. The Ministry is also offering gold, silver and bronze medals, with diplomas, for the three best entries in the Class for National Mark All-English (Yeoman) Flour, open only to authorized millers, in the British Wheat Flour Competition at the Exhibition, and a gold medal to the farmer providing the largest proportion of the wheat used in the winning flour. The flour must be milled solely from Yeoman wheat grown in England and Wales and must comply with the standards of quality required for all-English (Yeoman) flour packed under the National Mark. Entries must consist of three bags of flour of 7 lb. each, and one 2-lb bag of the wheat used must be sent in. The National Farmers' Union is offering three prizes of £10, £5 and £3, respectively, for the best 1-lb all-English Commercial Milk Loaf (Tin) made from National Mark flour.

Film Van Tours.—The Ministry has arranged tours, which commenced on June 6 and will last for three months, by two talking-film vans for the purpose of bringing to notice the aims and objects of the National Mark movement. The first van

started from Maidstone and will tour Kent, Sussex, Hampshire, Dorset and Somerset, while the second started in Leeds and will proceed, by way of the Yorkshire coast towns, to Durham, Northumberland, Cumberland, Westmorland and Lancashire.

The National Mark films to be shown, with talk commentaries, include such subjects as the canning of fruit and vegetables, the manufacture of cider, strawberry growing and packing, a National Mark apple packing station, and humorous cartoon films of English agriculture and National Mark beef. The vans will be accompanied by an officer of the Ministry, who will give a short address, during the programme, on the National Mark movement and will be available to answer inquiries and distribute literature. It is hoped by means of the van, not only to interest the consuming public, but also, by visiting country towns on market days, to reach producers.

Displays of National Mark and Other Home Produce.—A display of home-produce was arranged by the Ministry, in co-operation with the National Farmers' Union, in the Empire Section at the Aldershot Horse Show, June 29–July 2. One half of the stand was devoted to National Mark products.

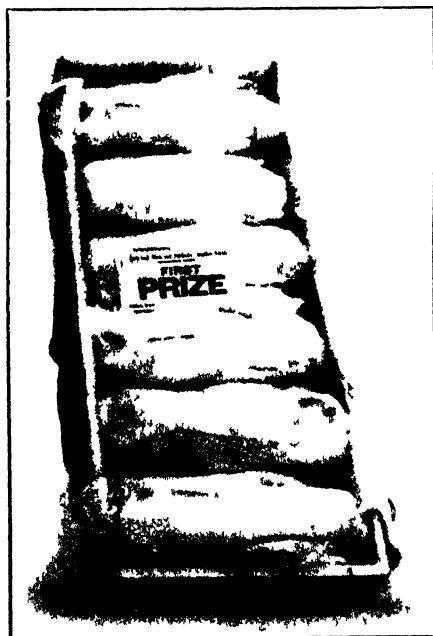
National Mark produce was also displayed at a festival held at Bury St. Edmunds on June 11 by the West Suffolk Federation of Women's Institutes.

Use of Home Produce in Hotels and Restaurants.—The Committee of representatives of leading hotel groups and catering firms that is exploring the possibilities of a greater use of home produce by their trade conferred with the National Mark Canned Fruit and Vegetables Trade Committee and certain individual canners at a meeting held on June 6. Earl De La Warr, Parliamentary Secretary to the Ministry of Agriculture, presided.

It was already known that large quantities of canned English fruits and vegetables (mainly peas) were purchased by the catering trade. The purpose of the meeting was to consider the special requirements of hotels and restaurants, not only as regards particular fruits and vegetables that are still mainly obtained from abroad, but also in connexion with such matters as sizes of can, size-grading and quality-grading, and strength of syrup. The discussion at the meeting, a full report of which has been circulated for the information of all canners, should be of material assistance to the industry in its efforts to supply the type of goods required by this special class of consumer.



1st prize pack of 160 chickens



1st prize pack of 300 ducklings

MARKET PACKS OF GRADED AND DRESSED POULTRY
AT THE BATH AND WEST SHOW

Marketing Demonstrations.—Demonstrations of methods of marketing agricultural and horticultural produce will be given by the Ministry during July as follows :—

The Royal, Southampton	July 5-9 .	National Mark Hall ; Butter ; Organization of Wool Marketing ; Organization of Potato Marketing.
Great Yorkshire, Leeds	July 12-14	National Mark Hall ; Wool, Potatoes, Mutton and Lamb.
Tunbridge Wells	July 19-20	National Mark Hall ; Potatoes , Eggs.
Royal Welsh, Llandrindod Wells	July 20-22	Butter ; Wool ; Mutton ; Eggs.
Royal Lancs, Preston	July 28- Aug. 1	National Mark Hall ; Potatoes.

The Ministry's Pavilion at the Royal Counties Show at Guildford (June 1-4) and at the Three Counties Show, Gloucester (June 7-9), was visited by H.R.H. the Duke of Gloucester. At the Cambridge and Isle of Ely Show at Wisbech (June 2) the Ministry's stand was visited by H.R.H. Prince George.

Dressed Poultry Classes at the Bath and West Show.—The Bath and West Show is the first to recognize up-to-date marketing methods by including, at the Show held at Yeovil from May 25-28, classes for market packs of graded dressed poultry that conform to modern commercial requirements.

The classifications were as follows :—

- Market Pack of 6 Cockerels, shaped for market but not drawn. Net maximum weight of Pack 33 lb. (overweight will be disqualified). Birds to be shaped in "Surrey" style, i.e., pressed and tied loosely around the hocks only.
- Market Pack of 6 Fat Ducklings. Birds to be shaped for market but not drawn.

Photographs of the packs that secured the first prize in each class are reproduced facing page 364.

The Prince of Wales at the Nation's Foods Exhibition and the Bath and West Show.—The Prince of Wales has recently delivered two important speeches relating to agriculture in this country. In the course of his speech at the Nation's Foods Exhibition at Olympia on May 24, H.R.H. said :—

"I happen to own a considerable extent of agricultural land, and I, therefore, have some personal knowledge of farming in this country. I can with confidence assure both the distributor and the consuming public that our farmers to-day are very much alive to their present opportunities, and to the necessity of producing what the trade and the public require. They appreciate that, as with manufactured goods, modern commerce is based upon standardization, and that to be successful they must place on the market well-graded supplies of good quality, attractively

packed, and in regular and uniform quantities. As a landlord I encourage my tenants to visit the big stores in London, so that they may see exactly what consumers want. Some of them were rather shy about undertaking what to some of them seemed a great adventure, but now they come every summer, or whenever they can, to learn a great deal. Conversely, I encourage the big retailers in London to visit the factory—in my case the farm—to learn the difficulties of production on the spot, and to see if they can find any other commodities not generally known to the public.

"I now come to a very important point in connexion with the National Mark scheme. This is very useful machinery indeed, and it is playing an important part in the life of our country at the present time. The National Mark scheme movement gives great advantages to the distributor. It enables him to buy with confidence on sample or in bulk, and to secure regularity of supplies. At the same time it enables him to sell with equal confidence, so that his customers can be satisfied. To the consumer it also offers a guarantee of origin, good quality, and a ready means of identification. A big public demand has already been created for two commodities—namely, eggs and canned fruits and vegetables. This movement of standardized grading and packing has made the most progress by offering an article which is easily marketed. There is no question now as to the popularity of their appeal and the support of the public, and through the distributing trades a similar success can be anticipated in regard to other products which are already sold under the National Mark or may be so sold in the future."

On the occasion of his visit on May 27 to the Bath and West Show at Yeovil, the Prince of Wales referred to the present-day problems of agriculture in the following terms:—

"When times are bad we have to ask ourselves the same or very similar questions to those which are asked by the head of any big manufacturing concern.

"What are the questions that come to our minds to-day? In farming none of us want to reduce the number and wages of our labourers, who must be given a living wage. Therefore we are faced with two problems: the first, more efficient production, and the second, less expensive means of transport. With regard to the first, high as is the general technique of farming in this country, it is still capable of improvement. We must produce with a close watch on our markets so as to produce the variety and quality required by the public, for the people are getting to understand better the meaning of the words specialization and standardization of supplies.

"With regard to our second problem, the only way we can reduce the cost of transport in this country is by co-operation. I can remember the time when in the milk industry farmers delivered their milk to the retailer. Now, I am glad to say that it is becoming increasingly the habit for you to leave your churns of milk outside your farm to be collected by the distributor. This is a far less expensive way of getting your produce to market, and I believe it will be far more generally adopted for other farm produce . . .

"And here we come to one of the most important things in any industry, and that is the sales department. It has often been said that any fool can make an article, but you want a man

of ability to sell it. I think we farmers must ask ourselves if we are taking advantage of the machinery which we have for marketing our goods. You have a very useful piece of machinery in the National Mark, designed to denote genuine English produce, graded and packed to definite national standards, and applicable already to a growing group of commodities, and destined eventually to cover most others. It is because of attractive presentation rather than quality that the people in the big towns have learned to prefer certain imported articles—for instance, butter and bacon. We must not be too proud to look round and learn from our competitors. I stress this point of salesmanship because we farmers are now getting definitely more encouragement, and it appears to me that if we are going to make farming an economic proposition we must study our sales organization very closely.

"This is the day of big organization, and if our business is to prosper the obvious course seems to be to move with the times, and, forsaking our existing and understandable individualism, to rearrange the selling side of our enterprise, by combining together to form larger and stronger units for the disposal of our goods. The best Derby winner is no match for a Rolls-Royce, and the contest is just as unequal when the single farmer meets the big distributing firm on the market. . . .

"As I have said, farming as a whole has been too far divorced from ordinary industries. If at any time the industrial population had to pay more for their food they would be entitled to ask, 'Are these farms producing and marketing these commodities as economically and efficiently as possible?' If we reduce the cost of our transport by co-operation and increase the efficiency of our sales department, we could tell the industrial population that they are getting a high-class article at a reasonable price. . . .

"The aim of all in our several spheres must be to sell more and better and to buy more and oftener home-grown produce."

Germany : Egg Legislation.—The German Minister for Food and Agriculture has issued a Decree, dated March 17, 1932, prescribing commercial quality and weight grades for hen eggs, marks to be applied to eggs packed under those grades, and marks to be placed on the containers. The Decree also prescribes the marks to be applied to cold-stored and preserved hen eggs and to their containers. In addition, it indicates the marking required on eggs imported into Germany.

The following is a summary of the Decree which, with the exception of certain provisions, became operative four weeks after the date of promulgation.

Grade Designations and Definitions.—Two quality grades are prescribed for hen eggs—New Laid and Fresh—as in the table hereunder:—

Eggs of other kinds of poultry, as well as hen eggs below 45 grammes in weight, cold-stored eggs, preserved eggs, dirty, cracked or broken eggs, eggs with blood spots or blood rings, eggs with spotted shells (mouldy), red or black rotten eggs and addled eggs, must not be offered, stocked for sale, sold or otherwise introduced into trade as eggs of the legal commercial grades.

Marking.—Eggs produced in Germany may be marketed with the description of one of the legal commercial grades only if each egg is marked with a stamp consisting of a ring of a diameter of at least

GERMANY: EGG GRADES

Grade designation	DEFINITION OF QUALITY						WEIGHT GRADES		
	Shell	Air space	White	Yolk	Germ	Smell	Weight grade	Weight of single egg (also in packing)	Average weight (net weight) of eggs in packing
G.1 (New laid)	Normal, not clean, not damaged, unwashed	Not more than 5 mm., unmovable	Transparent and firm	Only visible as a shadow without plain outline; on turning the egg round the yolk must remain in central position	Not visibly developed	Free of bad or strange smell	S (Special) A (Large) B (Medium) C (Ordinary) D (Small)	Grammes	Grammes
							S (Special) A (Large) B (Medium) C (Ordinary) D (Small)	65 and over 60 to 64 55 to 59 50 to 54 45 to 49	At least 66 62-63 57-58 52-53 47-48
G.2 (Fresh)	Do.	Not more than 10 mm. unmovable	Do.	Only visible as a shadow without plain outline; on turning the egg round, the yolk may not move far from central position					

12 mm. encircling the word "Deutsch" in letters of at least 2 mm. in height, and also the letter denoting the weight grade.

Imported fresh eggs may similarly be marketed under the statutory grades if each egg is marked with a stamp containing in the centre the letter denoting the weight grade, such marking being additional to the required indication of origin (*see* p. 371).

In addition to being legible, the markings must be indelible, withstand boiling and be non-injurious to health. From March 15 to August 31, markings must be in black, and from September 1 to March 14, in red. Eggs which can be proved to have been dispatched before the commencement of these periods may be marked with the colour valid at the date of dispatch.

Any eggs so marked which are offered for sale unpacked must be displayed according to grade. In addition, the quality, grade and weight must be indicated by means of prominently displayed notices of specified dimensions.

Labels.—If any German eggs are marketed under one of the legal commercial grades in sealed cases, the cases are required to bear either one or two approved labels according to the size of the case. The labels, which are in two sizes for each of the two grades, bear in the middle the design of an eagle crest. They must also contain, on the top left-hand side, the words *Deutsche Eier*, and below, the full name and address of the consignor; on the top right side, the quality and weight grades, and below, the control number and particulars of the date of packing, in clear and indelible print. The basic colour of the labels is white for Grade G 1, and blue for Grade G 2. The labels may only be applied by authorized packers (*see* below) and in such manner that they are broken when the case is first opened.

Every case is required to contain a packing slip of specified dimensions, on which must be reproduced the words *Deutsche Eier*, the same control number as appears on the label or labels, particulars of the quality and weight grades of the eggs, in the middle of the slip the word *Kontrollzettel*, the full name and address of the authorized packer, the names of the persons who tested and packed the eggs, as well as the date of packing.

Authorized packers must purchase labels and packing slips at prices fixed by the Minister for Food and Agriculture from the Supervisory Committee which granted their authorization.

Authorization of Packers.—Authorization to apply the prescribed marking to eggs or cases of eggs may only be granted as follows:—

(1) *For eggs produced in Germany* :—

- (a) To individual producers with at least 750 laying hens.
- (b) To such co-operative societies or other organizations of producers, as well as such egg merchants and associations of consumers, as are able to prove by means of legal contracts or of supply agreements with producers that they dispose of at least 2,000,000 German eggs per annum.

If these organizations, etc., operate several packing stations, then authorization is necessary in respect of each station; authorization may, however, only be granted for packing stations which can prove a yearly turnover of at least 150,000 German eggs.

(2) *For imported eggs* :—

To wholesale distributors who can prove that in the year previous to their application they imported at least 2,000,000 eggs into Germany.

Applicants must, in addition, have suitable equipment, including candling lamps, weight-grading apparatus, and apparatus for ascer-

taining the size of air space in eggs ; also, charts with diagrams showing the minimum requirements of the various grades, which are required to be placed in such positions as to be easily seen by persons employed in testing and grading. As in the case of labels and packing slips, these charts must be purchased from the Supervisory Committee at prices fixed by the Minister for Food and Agriculture.

Before permission is granted, applicants must give a written undertaking :—

- (1) To employ only experienced persons for testing, sorting and packing.
- (2) To arrange, where necessary, for at least a weekly collection of supplies from producers.
- (3) To single-light test each egg within two days before dispatch.
- (4) To pack eggs produced in Germany which are marketed after March 31, 1933, only in cases holding 500, 360 or 180 eggs, or small cartons holding one dozen eggs, and to pack only eggs of one grade of quality and weight in each case.
- (5) To allow inspection of premises and equipment.
- (6) In the event of cancellation of authority, to surrender stamps, labels, etc., immediately and without compensation.
- (7) In the case of individual producers who possess at least 750 laying hens to mark only their own supplies, and
- (8) In the case of co-operative societies and other organizations of producers, egg merchants or associations of consumers, to mark only such eggs as are included in their contract obligations or in current supply agreements with producers.

Provision is made for the withdrawal of authorizations in specified circumstances ; in such cases, a fresh authorization may only be issued after the expiration of at least one year from the date of withdrawal.

Supervisory Committees.—Supervisory Committees, which are responsible to the supreme State authority, are required to be formed by each Chamber of Agriculture, or, where there are no Chambers of Agriculture, by the Department decided upon by the supreme State authority. The Committees have power to issue and withdraw certificates of authorization, to supervise the general administration of the scheme in their area, and to issue labels, packing slips and charts. The supreme State authority, or the Department concerned, is to control the Supervisory Committees and is empowered to investigate and alter decisions of those Committees.

The expenses of Supervisory Committees will be met out of profits from the sale of labels, etc., and any surplus is to be applied to promoting the objects aimed at by the Decree. Provision is also made for the meeting of any deficiency by the imposition of a levy.

Special Provisions for Cold-stored and Preserved Hen Eggs.

Cold-stored hen eggs may only be marketed for eating purposes if :—

- (i) each egg is legibly stamped in black, indelible colour, which must withstand boiling and be non-injurious to health. The stamp must be in the form of an equilateral triangle, with sides at least 15 mm. long, in the centre of which is a large letter "K" ;
- (ii) the word *Kühkhauseier* is branded or permanently impressed in black block letters at least 3 cm. in height on the front of the packing case.

Preserved hen eggs may only be marketed for eating purposes if :—

- (i) each egg is marked with the word *Konserviert* in black, indelible colour, which must withstand boiling and be non-injurious to health. The marking must be in Roman letters at least 3 mm. in height ;

- (ii) the words *Konservierte Eier* are branded or permanently impressed in black block letters at least 3 cm. in height on the front of the packing case.

If cold-stored or preserved eggs are marketed unpacked, notices of specified dimensions must prominently be displayed on the egg containers or on the stands on which they are placed in the sale premises, bearing the word *Kühlhauseier* in the case of cold-stored eggs and *Konservierte Eier* in the case of preserved eggs, in letters at least 3 cm. in height.

Importation of Eggs into Germany.—Imported eggs for human consumption, as well as the cases in which they are packed, must bear a stamp containing in Roman lettering the name of the country of origin. The stamp must be placed on each egg in indelible colour which will withstand boiling and be non-injurious to health, the letters to be at least 2 mm. in height, the lettering on the cases to be at least 3 cm. in height. Imported cold-stored or preserved eggs are required to be marked in black and in similar fashion to cold-stored or preserved eggs produced in Germany.

Eggs and their cases which are not marked before importation must be placed in the Customs warehouse in bond. The necessary markings may be carried out in the Customs warehouse.

General.—Apart from the markings previously specified, no additional markings are permitted on eggs or containers (except eggs as described for breeding purposes), whether imported or otherwise, except as follows :—

- (1) *On the container*—

The name of the firm and weight of package.

- (2) *On the egg or container*—

(a) a number for record purposes ;

(b) in the case of eggs produced in Germany which are not marketed under one of the legal designations, the name and address of the producer ;

(c) on imported eggs, in addition to the proscribed marking, a control stamp in accordance with regulations, if any, of the exporting country.

Offences against the Decree, whether intentional or through negligence, are punishable by a fine and/or three months' imprisonment. In addition, provision is made, in certain cases of intentional contravention, for the confiscation of the supplies concerned.

Wool Marketing.—A report on the Organization of Wool Marketing* has just been published as No. 35 of the Ministry's well-known Orange Books on marketing. It is the second in this series on the subject of wool marketing. While, however, the first was largely confined to a descriptive survey of marketing methods, the new report not only takes a wider view of the subject but aims at presenting, as a basis for consideration, the outline of a constructive programme of marketing organization.

The report opens with a short survey of production conditions in England and Wales and their bearing upon the problem of marketing. It is pointed out that the underlying factors that must condition the approach to organization are the small size of flock that is typical of this country, the large number of breeds and crosses, and the great

* *Economic Series* No. 35, H.M. Stationery Office, 6d. net. (9d. post free).

diversity of wool quality to be found within very small areas and within individual flocks.

A very brief description of the wool textile industry is then given and attention is drawn to the significant features of the structure of its organization in relation to the marketing problem.

An analysis of world and home production, consumption and prices shows that trade in wool is international, and British wool, unlike most home-grown agricultural commodities, is exported in large quantities.

Part II of the report is devoted to examination and consideration of the various methods of marketing that prevail in this country, in part in an attempt to estimate their relative efficiency, in part as a basis for comparison with the methods that have been adopted overseas. Except for a small proportion of wool that is marketed co-operatively, the significant feature of the predominant system of marketing British wool is that each producer's clip is sold individually and that, broadly speaking, it has failed to induce farmers to exercise care in the get-up of their clips or to regard wool as anything but a by-product of mutton production.

Part III deals with the organized wool marketing systems found in the more important wool-producing countries. There are two main systems. In the Southern Dominions of Australia, New Zealand and South Africa, the central auction system prevails. In the United States and Canada, selling is by private treaty, organization taking the form of co-operative marketing societies, originally local in character, federating later into highly centralized units. The reasons for the development of two marketing systems of this kind in different regions are discussed and related to conditions of production and the needs of the buyer. Although in the North American system, producers' control over marketing is more direct, the co-ordination between brokers' and growers' representatives in the southern Dominions as regards the planning and conduct of auctions gives producers a considerable measure of control.

Underlying both systems are principles that are essential to efficient organized marketing, namely, the bulking on a grade basis of the small mixed clip before sale and the surrender by the individual producer of direct control over the time, place and terms of sale of his wool. It is suggested that these principles must be applied throughout this country if wool marketing is to be put upon a rational basis. Part IV of the report draws a ground plan for future development on these lines. The procedure suggested is the formation of regional wool marketing organizations, which might gradually develop by national stages into a comprehensive national system. Although it is possible that organization in this way might proceed upon a voluntary basis, it is suggested that a scheme under the Agricultural Marketing Act, 1931, would have a greater chance of success. Such a scheme would have, in the first place, the advantage of rapidity of progress. The necessary volume and continuity of supplies would be guaranteed, and the selling strength and credit position of organized producers would be greatly enhanced.

The suggestions put forward in the report do not claim to be more than tentative. The purpose of the report will have been fulfilled if it assists the home industry to see its own problems clearly and to propound a solution for itself.

JULY ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

The Weather and Labour Costs.—In an ordinary season the first cuts of “seeds” and clover hay and most of the upland meadow hay in southern England is secured in June. In the northern districts July is the most important haymaking time. In the south root-hoeing clashes rather badly with haymaking, and this is in some part responsible for raising the bill for wages at this period, as either extra men or more overtime by the regular men is necessary to get both jobs done more or less at the same time. The adoption of “summer time” has also added to the difficulties in this respect, and the alteration of the clock one hour backwards instead of forwards would fit in better with both harvesting and hay-making operations.

The farmer is compelled to take more than ordinary interest in the weather; on it depends to a very large extent the size and quality of his crops when growing, and the harvesting of hay and cereals in good condition is dependent upon fine weather.

The bill for wages likewise varies with weather conditions, and adverse weather not only depreciates the value of the produce but also increases the cost of securing the crop.

Values of Produce and Systems of Farming.—As the cost of labour has risen in proportion to the value of the produce, so methods of cropping have been varied. The conversion of arable land to permanent pasture is one of the most apparent consequences of the fall in price of cereals. As long as cereals are at a low price grass land will maintain its position, and may even tend to increase in area, and live stock products will predominate as a source of farm revenue.

An increase in the value of cereals could easily alter the relative positions of arable and pasture cultivation. Live stock cannot be kept intensively on grass land without some outlay for supplementary foods, and when these are wholly purchased their price is an important factor. High prices for feeding stuffs would concentrate more attention on arable land crops, and even where live stock is the main source of revenue it might be found more economical to grow some of the concentrated food required.

Bastard Fallows.—A practice that has increased in late years is what is termed a bastard fallow. There are many

circumstances that favour the practice, and it can be highly recommended. The usual place in the rotation is after the removal of the seeds-hay crop from land that is to be sown with cereals in the autumn. A seeds mixture containing a high proportion of rye-grass may give either a full year's grazing or one hay crop and grazing for the remainder of the season, and be cut for hay in the second year, when the sod is immediately broken up and subjected to a thorough cultivation. The farm tractor is ideal for this type of work : continuous working for a few weeks will practically kill all growth, the turf will begin to decay, and the land is easily prepared for autumn sowing. If weather conditions are favourable and the turf is well broken up it may be possible to sow mustard seed at the rate of 20 lb. per acre, and thus provide a means of keeping down weed growth and at the same time a crop that can either be fed on the land to sheep or ploughed under as green manure.

A cover crop of this description has a further advantage in decreasing the likelihood of an attack of wheat bulb fly on the following wheat crop.

A bastard fallow can also be used to renew a pasture that for some reason has got into bad condition. If the land is ploughed up in summer and frequently cultivated it can be sown either in autumn or spring with a cereal in which a grass-seed mixture can be sown in the following April. On land not too well suited for arable cultivation this method is preferable to a course of cropping involving a subsequent cleaning crop before the land can be resown to pasture.

Bare Fallows.—Conditions for bare fallow cultivation have not been favourable, and where weeds have not been killed by the cultivations already carried out no time should be lost in working the land down to a tilth and cultivating out the bulk of the weeds. Mustard seed may then be sown, and its quick and bulky growth may be relied upon to weaken or destroy the remainder so that they will not interfere with the succeeding crops.

Farm Prospects.—This is a good time for the farmer to look round and measure his success or failure as a producer. The bulk of the hay crop and, in the earlier districts, the quality of the hay can be ascertained. The prospects for harvest can be fairly well judged, and the general merit of the root crops will be apparent.

On grass land the peak of production will have been passed and the yield of milk will be on the decline unless the grass

is under the intensive system of production or is well supported by supplementary feeding stuffs, whether green forage or concentrated food. Stock on grass land should be in their best thriving condition and at a minimum expense in labour and purchased feeding stuffs.

If the crops and stock are all that could be desired the farmer's anxieties will not be removed until the market value of the produce is known. It is inevitable that even the best and most successful farmer will be able to discover some shortcomings on the production side as well as on that of disposal.

The nature and quality of the land will account for much ; in no small degree the weather will be blamed for certain things, for it will be recalled that the weather was dry when rain would have been beneficial, wet when dry weather would have been appreciated, or cold when heat was very necessary.

Insect pests and diseases of crops and stock will have been in evidence, and the extent of damage caused by these misfortunes will be a material factor in the success or otherwise of the production side of farm business. Farmers are so used to experiencing some loss from such troubles that they are apt to look upon them as inseparable from their business, and in many cases it is not until they are serious that advice is sought and some determined effort made to remedy the trouble.

Entomologists, mycologists and veterinary practitioners are not always able to effect complete remedies, and are too often called upon when a trouble has assumed such proportions that serious loss has already been sustained.

It is highly desirable that the exact cause of any trouble should be diagnosed early, so that preventive measures may be possible.

Crop failures are often attributed to slug or wireworm attack, whereas they may be due to other causes, such as an unsuitable variety of crop ; sowing at the wrong time ; unsuitable cultural conditions ; fungus or bacterial disease not apparent to everyone ; or to unsuitable or inadequate manuring.

Among the stock a "waster" may be affected by one definite disease out of several which can cause such appearances, or by a combination of two or more such diseases ; while a barren animal may fail to breed owing to one or other of several causes, and unless the particular trouble is diagnosed progress in the reduction of losses may be slow or non-existent.

PRICES OF ARTIFICIAL MANURES

Average prices per ton during week
ended June 8

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	9 0	9 0	9 0	9 0	11 7
" „ Granulated (N. 16%) ..	9 0	9 0	9 0	9 0	11 3
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	7 0d	7 0d	7 0d	7 0d	6 10
Calcium cyanamide (N. 20·6%) ..	7 0e	7 0e	7 0e	7 0e	6 10
Kainit (Pot. 14%) ..	3 16	3 9	3 5	3 6g	4 9
Potash salts (Pot. 30%) ..	6 1	5 14	5 11	5 11g	3 8
" (Pot. 20%) ..	4 7	4 1	3 17	3 19g	3 11
Muriate of potash (Pot. 50%) ..	11 9	10 17	10 11	10 18g	4 4
Sulphate " (Pot. 48%) ..	13 12	12 19	12 16	13 0g	5 5
Basic slag (P.A. 15½%)|| ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)|| ..	2 5c	1 14c	1 14c	2 1c	3 0
" (P.A. 11%)|| ..	§ ..	1 9c	1 9c	..	..
Ground rock-phosphate (P.A. 26·27½%)|| ..	2 10a	..	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%) ..	3 2	..	3 5	2 17k	3 7
" (S.P.A. 13½%) ..	2 17	2 9	3 0	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	8 15	6 15	7 10	5 17	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 19b	5 2f	6 0	4 15	..

Abbreviations: N.—Nitrogen; P.A.—Phosphoric Acid; S.P.A.—Soluble Phosphoric Acid; Pot.—Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc.(Agric.),
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Feeding for Fat Lamb Production.—Speaking on early fat lamb production, Mr. R. E. Bennett, at the Moulton Sheep Conference on May 26, gave details of methods employed in Dorset. He stated that in his county, to produce fat lambs in large numbers, it was considered necessary to have an appropriate acreage of roots, viz., swedes, turnips and mangolds, followed by rye-grass and trefoil, trifolium, vetches, etc. This system of lamb feeding is discussed by Street in *Farmer's Glory*, where he describes Wiltshire practice of the pre-war period. Mr. Bennett considered that it would not be possible in Dorset, in any case, to produce fat lambs on a large commercial scale without root crops, although he agreed that in certain favoured districts out-of-season lambs might be reared on grass, at least as a side-line. His view was, however, that production on grass land might be subject to limitations.

Those who have attempted to produce early fat lambs mainly or entirely on grass land will agree with Mr. Bennett that some arable land crops are of special value from December until the grass comes in spring, while the value of temporary leys for young lambs is widely recognized. In Northants, however, attempts to produce early fat lambs mainly on grass land have so far met with some success, but the numbers raised on any one farm are considerably smaller than on Dorset farms.

Mr. Bennett's practice is to have his first lambs from his Dorset Horn flock on the market in January, and by February they are in large supply, while most Dorset farmers who cater for the early fat lamb trade aim at clearing out all their fat lambs before swedes are finished in March. The ewes and young lambs are first drafted to a fresh clover or seeds ley and later folded on turnips. The usual method is to draft the single ram lambs and twins into the same lot and the single ewe lambs into another lot. The single ram lambs and twins are given better treatment than the ewe lambs. The lambs run forward through creeps in order to get the first pick of whatever crop they may be folded upon. Ewes are given decorticated earth-nut cake and oats, and the lambs a mixture of linseed cake, peas and oats.

The results of German investigations in the feeding of ewes and lambs were discussed in this JOURNAL, March, 1932,

p. 1274. It was stated that these results had shown that it was necessary to limit the proportion of protein equivalent and starch equivalent to 1 in 4. To conform with the German standard, 1 part (by weight) of decorticated ground-nut cake to 4 parts of oats is a suitable mixture for the ewes, while a suitable mixture for the lambs consists of equal parts by weight of the prescribed ingredients. For the ewes, $\frac{1}{4}$ lb. for, say, three weeks before lambing, increased to $\frac{1}{2}$ lb., or in special cases, to 1 lb., per head per day, generally proves adequate.

In fat lamb production the matter of fundamental importance is to get the ewes to milk well. Data recorded at this Institute, together with the examination of carcasses, have shown that, in order to secure a carcass corresponding to first or "select" grade at 40 lb. dead weight, the amount of milk which the lamb has consumed is the principal determining factor, primary even to the matter of breed or cross. In the feeding of the ewe the aim should therefore be to stimulate milk production, and in the case of the lamb itself to supplement the milk with digestible and attractive dry food, suitably balanced for the lamb's needs, and, in particular, designed to correct any scouring tendency of the grass, green food or root crop on which the lamb is feeding. In certain cases, linseed cake to the extent of one third of the ration may be too laxative for this purpose, and it may then be necessary to replace it with a food lower in oil, and without laxative properties. Young lambs that are slaughtered to kill about 40 lb. dead weight at, say, 12 to 14 weeks old may require during their short life a total of from 21 to 28 lb. of concentrated food—about 2s. worth. If the expenditure of 2s. makes the difference between getting, and not getting, a really well-finished lamb at the correct weight then it will be found to be money well spent. Those who wish to catch the early fat lamb market sometimes err on the side of attempting to over economize on their expenditure on suitable lamb foods.

Green Food for Pigs.—Pig breeders are hoping that the work of the Pig Industry Commission will lead to an improvement in the conditions of pig-keeping in the near future. If this should prove to be correct, more interest will, doubtless, be taken in the possibility of improving pig-keeping methods than can be expected under present conditions. Recently some light has been thrown on the cause and cure of a certain unthriftiness in pigs that is considered to be due to rickets. The results of investigations carried out by the Research

Department of Messrs. Marsh & Baxter* confirm in a general way experience elsewhere. The disease of rickets is said to be due to faulty assimilation of lime and phosphates. Such faulty assimilation may arise from a deficiency of Vitamin D.

Vitamin D aids assimilation of the necessary minerals, and consequently the feeding of preparations rich in this vitamin tend to bring about the disappearance of rickets and a general improvement in health. This occurred in the experiments referred to, although the basal rations were not markedly deficient in Vitamin D.

Cod liver oil was found to be an effective source of Vitamin D. It is of special interest and importance, however, that fresh green food and sunlight proved entirely satisfactory natural sources of the vitamin.

For some time it has been recognized that cod-liver oil is specially valuable for winter use, and it is of interest to learn that one-tenth fluid ounce per head per day proved insufficient, but that when double this quantity was used the pigs not only avoided rickets but grew and developed at an improved rate. It is realized that the potency of cod-liver oil varies with different brands, and although attempts have been made to express this potency in terms of certain units, so far it would appear that the technique of measuring vitamin efficiency has not been entirely perfected. Purchasers may still experience some difficulty in estimating the value of supplies. A recent report dealing with this subject indicates that genuine cod-liver oil should have about 100 Vitamin D units per gramme.

The results of Messrs. Marsh & Baxter's experiments provide fresh evidence of the necessity and importance of providing green food, as well as fresh air and sunlight wherever possible. Pigs affected with rickets made progress towards recovery when placed in conditions which ensured a supply of fresh air and sunlight, in addition to green food.

The examination of figures obtained from pig-recording schemes has shown the value of out-door systems of pig-keeping and demonstrated the benefit of fresh air to breeding stock and young pigs. The general results obtained in the breeding herd at this Institute have confirmed observations made elsewhere as to the value of open-air methods. This subject has been freely ventilated in recent years, but it is not by any means uncommon to find pigs kept on farms and never given fresh vegetable food or green grass, although

* Publication No. 5, 1932, *Experiments on Pigs with Preparations of Vitamin D.*

abundant supplies may be available or even, to some extent, running to waste on these same farms. It is therefore opportune that an account of these experiments has been published, and it is of importance that the lessons to be learnt from them should be emphasized. It should become part and parcel of the regular routine in the feeding of all pigs on farms to ensure that every one of them shall receive a daily supply of fresh green grass or other suitable vegetable food in season. If such foods are not available in winter, recourse must be had to artificial preparations, such as those discussed in the publication under consideration.

Arrangements for ensuring that sunlight comes in direct contact with the skin of the pig are fundamental in promoting health. It is, of course, recognized that subjection of pigs, and little pigs in particular, to excessively strong sunlight for a prolonged period may be harmful. This is where the pig-keeper must exercise his judgment. Nevertheless, it would appear that many more pigs suffer from insufficient sunlight than from excess of it.

Whatever steps may be taken to improve conditions of the pig industry in this country, those steps can hardly bear adequate fruit unless there is a quickened interest on the part of many pig-keepers in the conditions that make for the general well-being of the pig.

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DESCRIPTION	Price per qt.		Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British.. ..	—	—	6 5	0 10	5 15	72	1 7	0-85	9-6
Barley, British feeding ..	—	—	7 0	0 8	6 12	71	1 10	0-98	6-2
" Canadian No. 3 Western	24 3	400	6 15	0 8	6 7	71	1 9	0-94	6-2
" Argentine	25 0	"	7 0	0 8	6 12	71	1 10	0-98	6-2
" Persian	23 9	"	6 13*	0 8	6 5	71	1 9	0-94	6-2
" Russian	24 9	"	6 18*	0 8	6 10	71	1 10	0-98	6-2
Oats, English white	—	—	8 7	0 9	7 18	60	2 8	1-43	7-6
" " black	—	—	9 0	0 9	7 11	60	2 6	1-34	7-6
" Canadian No. 2 Western	22 9	320	8 0	0 9	7 11	60	2 6	1-34	7-6
" " No. 3	22 0	"	7 13*	0 9	7 4	60	2 5	1-29	7-6
" " No. 1 Feed	21 3	"	7 8*	0 9	6 19	60	2 4	1-25	7-6
" " mixed	18 6	"	6 10*	0 9	6 1	60	2 0	1-07	7-6
" Argentine	18 6	"	6 10	0 9	6 1	60	2 0	1-07	7-6
" Russian	22 0	"	7 13*	0 9	7 4	60	2 5	1-29	7-6
Maize, Argentine	20 "	480	4 17	0 8	4 9	81	1 1	0-58	6-8
Peas, Indian	—	—	8 0*	0 18	7 2	69	2 1	1-12	18
" Japanese	—	—	24 0*	0 18	23 2	69	6 8	3-57	18
Dari	—	—	8 15*	0 10	8 5	74	2 3	1-20	7-2
Milling offals—									
Bran, British	—	—	6 0	1 0	5 0	42	2 5	1-29	10
" broad	—	—	6 10	1 0	5 10	42	2 7	1-38	10
Middlings, fine imported ..	—	—	7 5	0 15	6 10	69	1 11	1-03	12
" coarse British	—	—	6 12	0 15	5 17	58	2 0	1-07	11
Pollards, imported	—	—	6 5	0 19	5 6	60	1 9	0-94	11
Meal, barley	—	—	7 15	0 8	7 7	71	2 1	1-12	6-2
" maize	—	—	5 17	0 8	5 9	81	1 4	0-71	6-8
" " South African	—	—	5 7	0 8	4 19	81	1 3	0-67	6-8
" locust bean	—	—	6 10	0 7	6 3	71	1 9	0-94	3-6
" bean	—	—	8 0	1 0	7 0	66	2 1	1-12	20
" fish	—	—	14 15	2 16	11 19	53	4 6	2-41	48
Maize, cooked flaked	—	—	9 15	0 8	6 7	83	1 6	0-80	8-6
" gluten feed	—	—	5 17	0 15	5 2	76	1 4	0-71	19
Linseed cake, English, 12% oil	—	—	8 5	1 4	7 1	74	1 11	1-03	25
" " " 9% "	—	—	8 0	1 4	6 16	74	1 10	0-98	25
" " " 8% "	—	—	7 12	1 4	6 8	74	1 9	0-94	25
Soya-bean cake, 5½% oil ..	—	—	8 0*	1 14	6 6	69	1 10	0-98	36
Cottonseed cake—									
English, 4½% oil	—	—	4 17	1 4	3 13	42	1 9	0-94	17
Egyptian, 4½% "	—	—	4 11	1 4	3 7	42	1 7	0-85	17
Decorticated cottonseed meal	—	—	8 5*	1 15	6 10	74	1 9	0-94	35
Decorticated ground-nut cake	—	—	8 5	1 13	6 12	73	1 10	0-98	41
" 6-7% oil	—	—	8 5	1 13	6 12	73	1 10	0-98	41
Palm-kernel cake, 4½-5½% oil	—	—	6 5*	0 14	5 11	75	1 6	0-80	17
" " " meal, 4½% oil ..	—	—	6 15*	0 14	6 1	75	1 7	0-85	17
" " " meal, 1-2% oil ..	—	—	5 15	0 15	5 0	71	1 5	0-76	17
Feeding treacle	—	—	5 0	0 9	4 11	51	1 9	0-84	2-7
Brewers' grains, dried ale ..	—	—	6 0	0 15	5 5	48	2 2	1-16	13
" " " porter	—	—	5 10	0 15	4 15	48	2 0	1-07	13

* At Bristol.

† At Liverpool.

‡ At Hull.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of May, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £18 per ton, then since its manurial value is 2s. per ton as shown above, the food value per ton is £3 16s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 25-4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1-29d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the open local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own market. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 10d.; P, 0s.; K, 7d.; S, 0s. 2d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows:—

	Starch equivalent	Protein equivalent	Per ton
	Per cent.	Per cent.	£ s.
Barley (imported)	71	6.2	6 18
Maize	81	6.8	4 17
Decorticated ground-nut cake	73	41.0	8 5
„ cotton cake	71	34.0	7 15

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.53 shillings, and per unit protein equivalent, 1.60 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The “ food values ” which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1931, issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

CROPS	Starch equivalent	Protein equivalent	Food value per ton, on farm
	Per cent.	Per cent.	£ s.
Wheat	72	9.6	6 5
Oats	60	7.6	5 4
Barley	71	6.2	5 18
Potatoes	18	0.6	1 8
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 11
Beans	66	20.0	6 13
Good meadow hay	37	4.6	3 4
Good oat straw	20	0.9	1 12
Good clover hay	38	7.0	3 9
Vetch and oat silage	13	1.6	1 2
Barley straw	23	0.7	1 16
Wheat straw	13	0.1	1 0
Bean straw	23	1.7	1 18

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C.2, price 6d. net.

MISCELLANEOUS NOTES

FORMERLY large supplies of cauliflowers were imported for pickling, the term "foreign specials" being applied to those used in the preparation of first-class

Cauliflowers for Pickling

pickles. Owing to sterling depreciation and the institution of duties on imported cauliflowers, manufacturers are now paying more attention to the home market. For the past few years, home supplies have been mainly of the Veitch's Autumn Giant type, which yields a percentage of suitable heads, although it is, generally speaking, unsatisfactory for pickle-making. The percentage of "curd" to stem is small, and the latter is not used to any large extent in pickle making.

Experiments carried out at Kirton, under the auspices of the Horticultural Institute of the Lincolnshire County Council, have shown that the Danish Giant variety provides a type of head that is excellent for making the best pickles, and is certainly equivalent to the foreign specials formerly imported. This variety is not so easy to grow as Veitch's Autumn Giant. Under unfavourable conditions, it is liable to "buttoning." The variety should be grown as a principal crop, and the preparation of the soil should be begun early and tilth maintained up to the time of transplanting. Land in good heart, in fine tilth, and containing plenty of moisture is essential for the success of the crop. The plants must not be subjected to much check at any stage.

Stocks of Danish Giant vary considerably in quality of produce and also in yield. In 1930 four selected stocks were compared, two of which proved to be superior to the others. "Buttoning" occurred in two stocks only.

At Kirton the seed has usually been sown in late April, or in May where the crop was to be taken as a second crop. When the seed is sown as a main crop, probably on an average more favourable transplanting conditions would be secured by earlier sowing.

If, however, the crop succeeds an earlier one, such as cabbage, broccoli or early potatoes, sowing must be adjusted so that the plants will be ready for transplanting when the ground becomes available. If they are left in the seed bed for long after the best stage for transplanting, the plants tend to become drawn and "buttoning" is likely to occur, often in the plant bed itself. Late sowing is not necessarily harmful, and may be practised with confidence. In 1930 a sowing made so late as

June 4 struck the best conditions at transplanting time and yielded a crop of 3 tons 4 cwt. 56 lb. per acre of trimmed heads, the earlier sowings being less satisfactory.

				<i>Yield of trimmed heads per acre.</i>	
First sowing	..	April 17	..	1 ton	7 cwt.
Second sowing	..	May 19	..	2 ton	14 cwt.
Third sowing	..	June 4	..	3 ton	4 cwt. 56 lb.

In the crop from the first sowing, "buttoning" occurred and the stand of plants was not good.

Comparatively close planting is advisable, as the following figures show. They refer to an experiment carried out in 1930, the crop being taken on light silt land after spring cabbage. A plot of Veitch's Autumn Giant was included for comparative purposes.

<i>Danish Giant:</i>		<i>Yield per acre.</i>		
<i>Distance as planted.</i>		<i>Trimmed heads.</i>		
<i>Rows.</i>	<i>Between plants</i>	<i>Tons</i>	<i>cwt.</i>	<i>lb.</i>
1 ft. 6 in. ×	1 ft.	3	7	105
1 ft. 6 in. ×	1 ft. 6 in.	3	4	98
2 ft. ×	1 ft. 6 in.	2	5	44
2 ft. ×	2 ft.	2	3	15
<i>Veitch's Autumn Giant:</i>				
2 ft. ×	2 ft.	2	3	15

The produce of Danish Giant was all of "special" or "first grade," whereas the produce of Veitch's Autumn Giant was largely of second or third grade.

Cropping extends over a comparatively long period, and when it commences the crop should be cut over daily. Little other than "specials" or first grade heads will then be cut. If cutting is done at longer periods a proportion of the heads will have grown past their best and will have to be graded as seconds. If the daily cutting is not large enough to rail immediately, which is likely to be the case unless the acreage is large, or even in this case at the commencement and close of the cutting period, when the daily cuttings will be limited, brining should be practised. The heads should be trimmed of leaves and graded into "specials," "first grade," and "seconds," of which latter there should be only a small percentage. The heads are then placed in casks, generally hogsheds, with brine, thus enabling delivery to the factory to be effected as convenient, the brine being run off before railing.

Farmers who propose to grow pickling cauliflower should examine contract offers carefully, for they cannot afford the risk attached to the production of the high quality type unless an enhanced price is paid for it. In view of the present price

of the similar foreign article, a good price may be justly expected.

* * * * *

THE undermentioned Certificate and Report, issued by the Ministry in respect of the performance, under test, of a milk-refrigerating plant, have been printed

Agricultural and published together in pamphlet form.
Machinery Testing Copies of the pamphlet can be obtained
Committee from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 2d. net, post free 2½d.

No. 37. The "Desco" Ethyl Chloride Milk Refrigerating Plant, Size No. 2.

The plant was submitted for test by the manufacturers, The Dairy Supply Co., Ltd., Cumberland Avenue, Park Royal, London, N.W. 10.

* * * * *

THE May index of agricultural produce at 15 per cent. above 1911-13 was 2 points lower than in April, but 7 points below the level of May of last year. As

The Agricultural in the previous month price changes were
Index Number numerous, and for the most part followed the normal seasonal movement, but the prime cause of the reduction in the general index figure was the fall in the price of milk.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1927 :—

Month				Percentage increase compared with the average of the corresponding month in 1911-13.					
				1927	1928	1929	1930	1931	1932
January	..	..	..	49	45	45	48	30	23
February	..	..	..	45	43	44	44	26	17
March	..	..	..	43	45	43	39	23	13
April	..	..	..	43	51	46	37	23	17
May	..	..	..	42	54	44	34	22	15
June	..	..	..	41	58	40	31	23	—
July	..	..	..	42	45	41	34	21	—
August	..	..	..	42	44	52	35	21	—
September	..	..	..	43	44	52	42	20	—
October	..	..	..	40	39	42	29	13	—
November	..	..	..	37	41	44	29	12	—
December	..	..	..	38	40	43	26	17	—

Grain.—During the month under review wheat at an average of 6s. 1d. was 1d. per cwt. dearer, but as the increase between

April and May of the base years was relatively greater, the index figure was 2 points lower on the month at 23 per cent. below 1911-13. Oats also were dearer and showed an advance of 6d. per cwt., the index moving upwards by 2 points to 7 per cent. above pre-war as compared with 11 per cent. below at the corresponding period last year. Barley, however, was 7d. per cwt. cheaper in May at 7s. 2d. per cwt., and there was a drop of 8 points in the index to 7 per cent. below pre-war.

Live Stock.—Fat cattle were about 1s. per live cwt. dearer than in April and the index number was 2 points higher at 20 per cent. above the level of the base period. The price of fat sheep, however, fell by $\frac{1}{2}$ d. to 8d. per lb., but as the fall was proportionately less than that which occurred in May, 1911-13, the index showed a rise of 4 points to 7 per cent. above pre-war. Baconers were again a little dearer and the index was 3 points higher at 3 per cent. above the level of 1911-13. Quotations for porkers, however, continued to decline and this was reflected in a drop of 3 points in the index to 6 per cent. above pre-war. Dairy cows and store cattle again showed a slight decrease in price and the index for the former fell by 1 point to 18 per cent. above pre-war while that for store cattle remained stationary at 15 per cent. above. Store sheep were dearer during May, but the index figure at 11 per cent. below pre-war was also unaltered on the month. Store pigs were cheaper and the index fell by 4 points to precisely the pre-war figure.

Dairy and Poultry Produce.—The much lower prices paid for milk delivered under contract in certain areas resulted in the substantial drop of 13 points in the index, which now stands at 37 per cent. above pre-war as compared with 47 per cent. at the corresponding period last year. Quotations for farm butter followed the customary seasonal movement and were much lower than in April, the index being reduced 3 points to 8 per cent. above pre-war. Cheese was very slightly cheaper, but as the decrease between April and May of the base period was relatively much greater the index showed an increase of 4 points to a level of 43 per cent. above 1911-13. Eggs also were a shade cheaper during the month under review, whereas it is customary for prices to rise, and the index fell by 10 points to 3 per cent. below pre-war. A year ago eggs were selling at 7 per cent. above 1911-13. Fowls were a little dearer during May, and the combined index for poultry showed an advance of 9 points on the month.

Other Commodities.—Potatoes fully maintained the high prices ruling during April and the index number was 6 points higher at 145 per cent. above pre-war which compares with a figure of 85 per cent. in May, 1931. Quotations for hay were unaltered during the month under review, but the index moved upwards by 2 points to 30 per cent. below the level of the base period. Wool was $\frac{1}{4}$ d. per lb. cheaper than in April, causing the index to fall 2 points to 33 per cent. below pre-war.

Index numbers of different commodities during recent months and in May, 1930 and 1931, are shown below :—

*Percentage Increase as compared with the Average
Prices ruling in the corresponding months of
1911-13*

Commodity	1930	1931	1932			
	May	May	Feb.	Mar.	Apr.	May
Wheat	11	-28*	-24*	-19*	-21*	-23*
Barley	-1*	-10*	1	4	1	-7*
Oats	-11*	-11*	2	5	5	7
Fat cattle	30	19	19	21	18	20
„ sheep	63	40	Nil	Nil	3	7
Bacon pigs	61	21	-5*	-3*	Nil	3
Pork „	67	33	6	9	9	6
Dairy cows	29	24	21	20	19	18
Store cattle	28	25	23	21	15	15
„ sheep	46	28	-4*	-9*	-11*	-11*
„ pigs	108	52	14	5	4	Nil
Eggs	28	7	2	4	7	-3*
Poultry	64	63	23	23	27	36
Milk	55	47	46	17	50	37
Butter	23	8	7	7	11	8
Cheese	52	22	32	38	39	43
Potatoes	-36*	85	175	164	139	145
Hay	28	-10*	-28*	-30*	-32*	-30*
Wool	Nil	-21*	-22*	-24*	-31*	-33*

*Decrease.

* * * * *

ARRANGEMENTS have been made to hold a two weeks' practical course in farm engineering, with special reference to tractor driving, at the Midland Agricultural College, Sutton Bonington, Loughborough, commencing on September 5 next. The inclusive fee for board, lodging and instruction for the two weeks will be six guineas.

The course will give those who attend an opportunity of gaining an insight into the construction of the internal combustion engine, its practical working and the location of

faults, which subsequently may avoid much irritation and delay on the farm. It is recommended to all men who may be called upon later in life to handle a tractor. Application to attend the course should be addressed to the Principal at the College.

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It has been decided to continue in operation for another year, as from August 1, 1932, the following

Fees for Seed Testing	reductions in the fees payable for tests of seeds carried out at the Official Seed Testing Station :—
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(1) Purity Tests only :—

(a) Clover seeds (including examination for presence of Dodder.) Fee to be 3s. 6d. per sample.

(b) All other seeds .. Fee to be one-half of that chargeable for a complete test.

(2) *Garden, Vegetable and Root Seeds.* A 20 per cent. rebate will be given on the existing fees for samples of garden, vegetable and root seeds received between August 1 and September 15 on the condition that the Station is under no liability to test the samples immediately on receipt, but is at liberty to fit the testing in at a convenient time.

(3) *Deposit Accounts.* Firms with deposit accounts, sending 400 samples or over during the season, will have a rebate of 15 per cent. credited to their accounts.

* * * * *

THE Committee of the Economic Advisory Council appointed, under the Chairmanship of the Rt. Hon. Walter Elliott, M.P., to investigate the mineral content of

Mineral Content of Natural Pastures	natural pastures has presented its seventh report.* In the period under review considerable progress has been made with the work in Kenya, but for British readers
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the chief interest lies in the experiments conducted at the Garrochoran Sheep Station in Argyllshire. The pasture there is of the same general type as that found in the whole of the Western Highlands, and other parts where there is a deficiency of lime and a heavy rainfall. The herbage is markedly deficient in calcium more especially in the winter.

The main importance of the work in the West of Scotland

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W C.2. Price 3d., post free 4d.

is to be found in the light it throws on the influence of diet on the incidence of disease both in human beings and in animals. The results have an immediate practical bearing on sheep-rearing under similar conditions. In Scotland the sheep population in the hill grazings, which amount to nearly half of the hill area of that country, has shown a progressive decline in the last 50 years and is, to-day, 22 per cent. less than in 1880. Mortality has increased and fecundity has declined. The feeding to sheep, however, of the chemical substances known to be deficient in winter in the natural pastures has increased the fertility of the ewes by about 15 per cent. and has decreased the rate of mortality by over 25 per cent. In addition, the increase in the market value of the cast ewes and male lambs was sufficient to defray the cost of the whole of the material used in the experiments.

* * * * *

SINCE the date of the list published in the March, 1932, issue of this JOURNAL (p. 1285), the undermentioned Advisory Leaflets have been issued by the Ministry.

Advisory Leaflets The Leaflets starred are re-issues, without substantial revision, of leaflets in the old series and have not, therefore, been circulated to leaflet subscribers under the scheme set out in the December, 1930, issue of this JOURNAL. Copies of any or all of the starred leaflets will, however, be supplied free and post free to any leaflet subscriber who makes application.

- No. *12. Mole Draining.
- No. 75. The Hen Flea.
- No. 76. Poultry Mites.
- No. 77. Bird Lice.
- No. 78. The Gape Worm of Poultry.
- No. 79. Round Worms in Poultry.
- No. 80. Tapeworms in Poultry.
- No. *93. Epizootic Abortion in Cattle, or Slipping Calf.
- No. 94. The Cultivation of Maize for Fodder.
- No. 95. Foot Rot of Sheep.
- No. 97. The Breeding of Table Pigeons.
- No. *98. Peppermint: Its Cultivation and Distillation.
- No. 99. Powdery Scab of Potatoes.
- No. *100. Apple Canker.
- No. 101. Insurance of Farming Stock Against Fire.
- No. 102. Red-Worm Disease of Horses, or Strongylidosis.
- No. 103. Sheep-Scab.
- No. 104. Pig Feeding.
- No. 105. Poultry-Farming: Advice to Beginners.
- No. 106. Apple Aphides.
- No. 107. "Black Leg" of Potatoes.
- No. *108. The Cultivation of Basket Willows.
- No. *109. Flea Beetles.
- No. *110. The Frit Fly.

- No. *111. Nitrogenous Fertilizers.
- No. 112. Rearing and Marketing of Geese.
- No. 113. Chicken-Rearing.
- No. 115. Slugs and Snails.
- No. 116. Suggestions to Allotment Holders for Autumn Treatment of Land.
- No. 117. Winter Pruning Bush and Half-Standard Apple Trees.
- No. 121. Oats.
- No. 122. Sugar-Beet Growing.

* * * * * *

THE following notes on the two-year Demonstration in Poultry-keeping, using slatted-floor houses, at Stanmore, Middlesex,* have been communicated by **Poultry-Keeping on the Farm** Mr. J. Worthington, the County Poultry Instructor. The particulars cover the six months ending March 31, 1932.

Egg Production.—The present flock consists of 631 hens and 229 pullets, as compared with 750 and 250, respectively, last October. During the period under review 33,000 eggs have been produced by the hens, and 24,000 by the pullets introduced as replacements. These results indicate that culling should have been more drastic. Some 60 birds rather fat but still in lay were segregated last autumn, but their subsequent egg-production averaged only 4, 7 and 12, respectively, during the first three months of this year. The suggestion is made that on all farms birds of doubtful utility might be placed in a separate pen, and sold after three weeks if in poor condition or out of lay.

Culling.—The method employed in culling is as follows. A catching crate is wheeled to the exit, the main door is quietly opened, one end of a short length of wire netting is fixed to the hinged side, and the other end is carried around them by the attendant. They are then gently driven into the crate.

Health.—No cases of colds or infectious diseases have occurred. During the autumn of 1930 the colds then prevalent were attributed to the system of eaves ventilation, which were accordingly abolished in all the houses but one. It is noteworthy that this exceptional house has accommodated 60 pullets through the winter in perfect health and good production. Whenever possible one side section of the houses has been left open for pullets and moulting hens alike. No fault can be found with the ventilation of the houses, which are enlarged replicas of Sussex arks.

Feeding.—No change has been made in the rations since

* Previous notes have appeared in the issue of this JOURNAL for May (p. 217), July (p. 447), September (p. 669) and December (p. 962), 1931.

April, 1931. For convenience hens and pullets have been fed alike, but the low egg yield of the hens, the proportion of soft-shelled eggs, and the increasing number of dropical cases seem to suggest that better results might have been obtained by a reduction in the oil content. Coarse middlings is now being substituted for fine, and no maize will be fed to the hens in future.

Housing.—In January experiments were inaugurated for the purpose of testing night arks, singly and in pairs, and large houses on free range and in confined runs. To date the 240 birds on free range have averaged nearly 30 eggs as against 26 laid by the 300 enclosed in pens. Birds housed in lots of 25 in night arks, each with a separate run of one-tenth of an acre, have consistently given better results than those housed in lots of 50 in two night arks in a run of one-fifth of an acre.

* * * * *

Foot-and-Mouth Disease.—There has been no outbreak of Foot-and-Mouth Disease in Great Britain since the last issue of this JOURNAL went to press and there is now no part of Great Britain subject to Foot-and-Mouth Disease (Infected Area) Restrictions.

* * * * *

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W. 1, on Monday, May 30, 1932, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages, and proceeded to make the following Orders.

Dorset.—An Order continuing the operation of the existing minimum and overtime rates of wages from June 12, 1932, until June 10, 1933. The minimum rate in the case of male workers of 21 years of age and over is 30s. per week of 39½ hours in the week in which Boxing Day falls, and 44 hours in the weeks in which Good Friday, Easter Monday, Whit Monday and August Bank Holiday fall, with in addition in each of those weeks not more than three hours' employment in connexion with milking and the care of and attendance upon stock on each public holiday. In any other week in winter the minimum weekly wage is payable in respect of a week of 48 hours, and in any other week in summer in respect of 53½ hours. The overtime rate for male workers of 21 years of age and over is 8d. per hour. In the case of whole-time female workers of 21 years of age and over the minimum rate is 24s. per week of 39½ hours in the weeks in which Good Friday, Easter Monday, Whit Monday, August Bank Holiday and Boxing Day fall, with in addition in each of these weeks not more than three hours' employment in connexion with milking and the care of and attendance upon stock on each public holiday. In any other week the minimum weekly wage is payable in respect of 48 hours. The overtime rate for whole-time female workers of 20 years of age and over is 6d. per hour. In the case of part-time and casual female workers of 18 years of age and over the minimum rate is 5d. per hour with overtime at 6d. per hour.

Hampshire and Isle of Wight.—An Order fixing special differential rates of wages for overtime employment of male workers on the Corn Harvest in 1932; the rate in the case of such workers of 21 years of age and over being 9d. per hour.

Herefordshire.—An Order cancelling the existing minimum and overtime rates of wages as from June 18, 1932, and fixing fresh rates to come into operation on June 19, 1932, and to continue in operation until April 30, 1933. The minimum rate in the case of bailiffs, waggoners, stockmen and shepherds of 21 years of age and over is 35s. (instead of 36s. as at present) per week for all time necessarily spent on the immediate care of animals, not exceeding 60 hours. In the case of other classes of male workers of 21 years of age and over the minimum rate is 30s. (instead of 31s. as at present) per week of 44½ hours in the week in which Good Friday falls, 54 hours in any other week in summer, 39½ hours in the week in which Boxing Day falls, and 48 hours in any other week in winter. The overtime rate for all classes of male workers of 21 years of age and over is 8½d. per hour, except in certain circumstances, in the case of bailiffs, waggoners, stockmen and shepherds. In the case of female workers of 18 years of age and over the minimum rate is 4½d. per hour with overtime at 6d. per hour, except in certain circumstances on Boxing Day and Good Friday.

Hertfordshire.—(1) An Order fixing special differential rates of wages for overtime employment on the Hay Harvest in 1932, the rate in the case of male workers of 21 years of age and over being 10d. per hour, and in the case of female workers of 19 years of age and over 7½d. per hour.

(2) An Order fixing special minimum rates of wages for employment on the Corn Harvest in 1932, the rates in the case of male workers of 21 years of age and over being 9½d. per hour, and in the case of female workers of 21 years of age and over 6½d. per hour.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

* * * * *

Enforcement of Minimum Rates of Wages.—During the month ended June 14, legal proceedings were instituted against six employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County	Court	Fines imposed			Costs allowed			Arrears of wages ordered			No. of workers involved
		£	s.	d.	£	s.	d.	£	s.	d.	
Cheshire ..	Sandbach ..	2	0	0	—	—	—	27	0	0	2
Durham ..	Castle Eden	0	10	0	0	10	0	3	12	0	1
Hereford ..	Ledbury ..	6	0	0	—	—	—	20	13	3	2
Kent ..	Maidstone*	38	0	0	1	12	0	45	8	11	9
Northum- berland	Rothbury ..	2	0	0	—	—	—	4	10	0	1
Yorks, W.R.	Doncaster	5	0	0	—	—	—	16	15	5	1
		<hr/>			<hr/>			<hr/>			<hr/>
		£53	10	0	£2	2	0	£117	19	7	16

*In addition proceedings were taken against this employer under Section 9(3) (d) for giving false information, but the charge in that respect was dismissed.

Redemption of Tithe Rentscharge.—The Minister of Agriculture and Fisheries announces that, for the purpose of the redemption of tithe rentscharge, for which application is made after June 9, 1932, until further notice, the compensation for redemption will be 25 times the net amount of the tithe rentscharge, after the deductions prescribed by the Tithe Acts, 1918 to 1932, have been made.

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APPOINTMENTS

COUNTY AGRICULTURAL STAFFS

ENGLAND

The following is a correction of an announcement which appeared in the issue for last month (June):—

Dorset : Mr. P. Gale has been appointed Manager of Egg-Laying Trials *vice* Mr. C. F. Elliott (deceased).

WALES

Glamorgan : Mr. L. C. Ross has been appointed Instructor in Poultry-Keeping *vice* Mr. H. H. Duckett.

* * * * *

NOTICES OF BOOKS

The Agricultural Crisis. Vol. II. League of Nations Publications.

In a notice of this publication, appearing on page 299 of the last (June) issue of this JOURNAL, the price should have been stated as 3s. 3d. and not 7s. 6d. which is the price of Vol. I. The Publishers, Messrs George Allen & Unwin, Ltd., state that Vol. I, reviewing the agricultural situation in 39 countries, including Great Britain, has now been reprinted by the League.

Farmer's Glory. By A. G. Street. Pp. 312. (London: Faber & Faber, Ltd. 1932. Price 7s. 6d.)

The author of this book was born on a farm, of farming parentage, and from the time he left school has been employed on the land, first on his father's farm, next as a farm-worker in Canada and last as a farmer on his own account in England. The book covers the period from 1906 to 1931. Naturally, like all men of his age, he looks back to the period before the War as a sort of golden age. At that time the world seemed very stable and extremely comfortable to a large number of people, and the farmers, if Mr. Street's description of their life can be regarded as other than somewhat romantic, must have had a very pleasant time. During the War, of course, farmers made a good deal of money, and Mr. Street acknowledges this, but points out that, in common with the rest of the community, they were rather recklessly extravagant in the years immediately following the Armistice. Like many other writers on farming, however, he seems to be of the opinion that the depression that has been cumulative since 1922 has affected the farming industry only, or has, at least, affected it more than any other industry. He draws a picture of unrelieved gloom relating to these years, and indicates that since the financial situation caused him to give up arable farming, to take up dairy farming on the open-air system, he has had to work desperately hard, and to give up his hunting and much of his tennis-playing, in order to attain success. In fact, the farmer's standard of life, even where he is making a living, has been depressed just like that of most other members of the community. Mr. Street's book is written in a

direct and breezy style, is full of open air and sunshine, and is a delightful pen picture of country life. Altogether it makes very attractive reading, and is a commentary on the economic position of the country as a whole, as well as on the inability of the community to adjust itself quickly and completely to the changed economic conditions that have been the result of the War. Farmers will find Mr. Street's pages well worth reading.

"The Feathered World" Year Book, 1932. Pp. 550. (London: *The Feathered World*, 9 Arundel Street, W.C.2. Price 2s.)

With the present issue, this interesting annual reaches its twenty-first year. Its contents cover a wide range of subjects, including articles on electricity on the poultry farm, slatted floor houses, backyard poultry-keeping, features of poultry-house construction, and the culture of fancy pheasants. There are over 300 pages of illustrated articles on the various breeds of poultry and pigeons. Two articles that call for special mention are Sir Edward Brown's comprehensive review of the poultry industry in 1931, and a contribution by Mr. Edmund Burr, the well-known Norfolk turkey farmer, on "Extensive Turkey-Rearing: a Neglected Industry." The volume is full of useful information for all interested in poultry.

The Journal of the National Institute of Agricultural Botany. Vol. III, No. 1. Pp. 132. (Cambridge: W. Heffer & Sons, Ltd. Price 2s. 6d.)

This Journal contains reports on several branches of the Institute's work, including trials of autumn-sown wheat, sugar-beet strains, potato varieties and lucerne. Although the trials of the last-named were conducted at one centre only, the results have been such that the Institute is now able to give practical advice to farmers in regard to lucerne strains. Trials are being arranged at other centres, and it is anticipated that before long further information of considerable importance will be made available.

Introduction to Agricultural Biochemistry. By R. A. Dutcher and D. E. Haley. Pp. x + 484. (London: Chapman & Hall, Ltd.; New York: J. Wiley & Sons. 1932. Price 25s. net.)

The preface states that this volume is intended for students already possessing a preliminary knowledge of organic and inorganic chemistry. Limiting the field still further, it is almost impossible to avoid the conclusion that it has been written with an eye to the requirements of an American examination. It should serve this purpose admirably, and might also prove equally useful for British examinations. The facts are clearly set out, and in a way that should enable a knowledge of them to be acquired with a minimum expenditure of time and labour. At the same time, these qualities of the book detract from its value as a reference- or text-book for research workers. From their point of view it would have been better if the field covered had been smaller and the treatment more intensive, also if references to original work had been given in addition to the few "for general reading," so as to encourage the student to delve a little below the surface.

The book opens with a concise and informative history of agricultural chemistry up to the present time. The rest of Part I is devoted to the chemistry of carbohydrates, proteins, fats and a few other physiologically important compounds. A disproportionate amount of space has been devoted to the presentation of complex chemical formulae, and perhaps more might have been said about the properties and

biological importance of the different compounds. It is in this section that the influence of examination pressure is most obvious.

In Part II, soils, fertilizers and plant metabolism are discussed. It is still difficult to accord to soil science its proper place as a branch of biology, and the treatment of soil conditions hardly gives the reader an adequate idea of the biological unity of the soil, and its close connexion with the flora and fauna it nourishes. Fertilizers might advantageously have been treated more from the biological, and less from the manufacturing standpoint. The section on Plant Nutrition, and Part III, "The Animal," are the best in the book. There is a large amount of concise and useful information, including some of the recent work on vitamins and deficiency diseases, and here the authors seem to be on firmer ground than in the earlier parts of the book.

Some signs of loose writing are noticeable. Thus it is incorrect to state that uranium is no longer regarded as an element. On p. 109, "stereoisomerie" can hardly be a printer's error for "stoichiometric." The statement on p. 189 that "soils containing less than 10 per cent. of moisture appear to be dry" should be qualified, and "synthesis" (p. 386) is not the correct term to use for the formation of glycerol and fatty acids from glucose.

Poultry Enterprises. By S. Dickinson, B.S.A., M.S., Ph.D., and H. R. Lewis, B.S., M.Agr. Pp. viii+424. 251 Illustrations in text. (London: J. B. Lippincott Co. Price 10s. 6d.)

This book, written by American authors, is the result of educational and practical experience. Poultry farming is ably dealt with in all its aspects, from the building up of a farm to the marketing of the produce. For the convenience of teachers and students the various aspects of the industry are divided into sections, and model questions are given in connexion with each section in order to test the knowledge gained by the student. The preliminary chapters deal with the various methods adopted and the extent to which poultry farming is carried on in the various States. Tables of costings are given showing the necessary expenditure and profits that may be expected. Chapters dealing with the various breeds, culling, housing, feeding and rearing follow; sections are also devoted to artificial lighting and battery brooding, both of which are of special interest to the industry in this country at the present time. The production and marketing of fowls, ducks, geese and turkeys are described, and methods of book-keeping are illustrated. This book should be of value to teachers of poultry husbandry, students and those engaged in the poultry industry.

Mesembryanthema. By N. E. Brown, A. Tischer and M. C. Karsten. Edited by E. J. L. Labarre. Pp. xxvi+323. Illus. (Ashford: L. Reeve & Co., Ltd. Price 36s.)

This volume, which deals with a remarkable group of South African succulent plants, is beautifully illustrated by means of photographs and coloured plates. The book is written in English, German, and Dutch, each section being given in the three languages. There is a useful account of the cultivation of *Mesembryanthemums* which can, of course, only be grown under glass in this country. This is followed by a chapter on their general ecology, written by Miss M. C. Karsten, and the greater part of the book is devoted to scientific descriptions in all three languages, the majority of the species having been named by Dr. N. E. Brown. The book is a valuable one for South African botanists, and is of considerable interest to those who grow various species of this interesting group of plants in the British Isles.

De Bons Fromages par Tous et Partout (Cheeses for All). By H. Babet-Charton. Preface by Mme Babet-Charton. 2nd Ed. Pp. 96, 50 illustrations. (Paris: Librairie Agricole de la Maison Rustique, 26 rue Jacob, VIe. Price 7 frs.)

Under this pithy title Mlle Babet-Charton has compiled a concise guide to domestic cheesemaking, based on long experience as a student and instructress. The introductory chapters contain a general view of the subject, and are followed by sections dealing with renneting, pressing, straining the curd, equipment, and each of the types of cheese commonly made in France. Both text and illustrations are practical in scope and combine to form a useful manual on the subject.

Le Fraisier : Histories, Variétés, Cultures. By F. Lesourd. Pp. 232, 78 illustrations. (Paris: Librairie Agricole de la Maison Rustique, 26 rue Jacob, VIe. Price, 14 frs.)

Those who are interested in strawberry culture as practised in France will welcome this brochure, which contains detailed information on all branches of the subject, including an interesting historical introduction, descriptive notes on the varieties, new and old, and directions as to the best methods of cultivation. There is a chapter on the pests and maladies of strawberry plants, although the author is not always quite happy in the control measures which he recommends. The book is very inexpensive, having regard to the large amount of useful information which it contains, and, especially, to the remarkably clear and helpful illustrations.

Tomato and Cucumber Growing for Profit. By J. W. Morton. Pp. 63. (London: Eyre & Spottiswood. Price 2s.)

This brochure contains in convenient and compact form the essential facts relating to the cultivation of tomatoes and cucumbers. Its publication is opportune at the present time when conditions favour an extension of this branch of cultivation, and may be even said to render such an extension necessary.

Soil Conditions and Plant Growth. By Sir E. John Russell, D.Sc., F.R.S. 6th Edition. Pp. viii+636. Illus. (London: Longmans, Green & Co., 1932. Price 21s.)

The first edition of this monograph appeared twenty years ago as a modest volume of 168 pages. Since then, much progress has been made, practically every branch of physical science adding its contribution to the study of the subject. Important international conferences have been held, at which investigators from all parts of the world were able to exchange views and experiences, while in 1929 began the issue of Dr. E. Blanck's *Handbuch der Bodenlehre*, ten volumes of which have been published up to date. The mass of material thus recently acquired, and with the results of extensive research at Rothamsted and elsewhere, have been summarized and incorporated in the new edition of this standard work.

The Management, Manuring and Composition of Some Dorset Soils. Pp. 64. (Obtainable from the Agricultural Organizer for Dorset, Wadham House, Dorchester. Price 2s. 6d.)

The Dorset County Council arranged some years ago that 100 samples of soil from various parts of the county should be analyzed at the University of Reading, and that a report should be issued on the results. The report, which appeared under the title, *The Soils of Dorset*, has been used as a basis for the present publication, no later data being available

at the moment, but the advisory chapters have been revised throughout in the light of the latest experiments carried out in the county, and of analytical work on the soils in adjacent areas having the same geological formations. The information is presented as non-technically as possible, and the report should be of interest to practical agriculturists.

Practical Methods in Teaching Vocational Agriculture. By H. E. Lattig. Pp. xii+360. Illus. (London: McGraw-Hill Publishing Co., Ltd., 1931. Price 15s.)

The American system of vocational education differs materially from that employed in this country. Whereas most of the vocational training in agriculture in this country is given at Institutes and Colleges, the method adopted in America seems to be largely that of school instruction supplemented by practical projects, carried out by the pupils on the farms of their parents, with the definite object of engaging their attention and interest and of making a financial success of the undertaking. While, therefore, the methods suggested in Mr. Lattig's book cannot well be applied as a whole to this country, the book may nevertheless supply teachers of agriculture with ideas for enhancing the value of their instruction, and from this point of view it is worthy of their attention.

Farm Gas Engines and Tractors. By F. R. Jones, M.S. Pp. x+485. Illus. (London: McGraw-Hill Publishing Co., Ltd., 1932. Price 22s. 6d.)

While this book naturally deals with American types of engines and tractors, it is nevertheless a useful and comprehensive textbook for everyone concerned with the use of these machines on the farm. It contains full details of the construction and mechanism of the engines and, while not including anything very new to a skilled engineer, it is nevertheless the kind of work that would be of value to the student and to the general farmer. The book had its origin in a wide and lengthy experience of teaching to both collegiate and non-collegiate students, and this experience has been fully utilized in the planning and writing of the work, so that every detail is explained in a simple manner and, as far as possible, in non-technical language. The illustrations and diagrams with which the book is profusely illustrated make the letterpress still more easy to follow.

Insect Pests of Farm, Garden and Orchard. By E. D. Sanderson, Ph.D., 3rd edition, revised and enlarged by L. M. Peairs, Ph.D. Pp. vii+568. (London: Chapman & Hall, Ltd., New York: Wiley. 1931. Price 31s.)

This well-known American book has been largely rewritten and much new matter has been added. It is ten years since the second edition (noticed in this JOURNAL, May, 1922, p. 190) appeared, and the progress since made in control measures, and in knowledge of the bionomics of many pests, combined with the changed situation in America due to the spread of certain introduced insects which have become very important pests, amply justify Professor Peairs in undertaking the work of revision. The volume now gives an up-to-date account of all the important insect pests in the United States, other than forest insects, and includes four chapters on control methods and apparatus; there are a large number of illustrations, nearly all adequate and many of them excellent. Fortunately, the great majority of the insects discussed do not occur in this country, but, none the less, students of economic entomology here will find the book full of interesting and valuable information, brought together from widely scattered American sources.

SELECTED CONTENTS OF PERIODICALS

Agriculture, General and Miscellaneous

- The Further Development of Agricultural Practice. *H. G. Miller*. (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 160-167.) [63.191.]
- Recent Development in Construction and Arrangement of Farm Buildings. *A. C. Golding*. (Agric. Prog. ix (1932), pp. 115-124.) [69.]
- Farm Mechanization. *J. E. Newman*. (Agric. Prog., ix (1932), pp. 124-135.) [63.17; 63.191.]
- The Agricultural Crisis. *J. F. Duncan*. (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 123-131.) [338.1.]
- The Agricultural Depression and the methods by which it is being met. *A. G. Ruston*. (Jour. Farmers' Club, 1932, Part II (March), pp. 27-58.) [338.1 (42).]
- The Changing Outlook in Agriculture. *Sir E. J. Russell*. (Report of the British Association for the Advancement of Science. Centenary Meeting, London, September, 1931, pp. 230-252. Presidential Address, Section M.) [338.1 (42).]
- The Agriculture of the Counties of Berwick, Roxburgh and Selkirk. *A. R. Wannop*. (Agric. Prog. ix (1932), pp. 34-47.) [63 (41).]
- The Agriculture of Kent. *G. H. Garrad*. (Agric. Prog., ix (1932), pp. 48-55.) [63 (42).]
- The Farming of Mid-Cheshire. *S. Barratt*. (Agric. Prog., ix (1932), pp. 55-61.) [63 (42).]
- Prehistoric Agriculture in Britain. *E. C. Curwen*. (Jour. Bath and West and S. Counties Soc., Sixth Ser., vi (1931-1932), pp. 7-20.) [63 (09).]
- Water Meadows. *G. N. Rawlence*. (Jour. Bath and West and S. Counties Soc., Sixth Ser., vi (1931-1932), pp. 28-33.) [628.7.]
- Cycles in Animal Life. *A. D. Middleton*. (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 146-152.) [575.]
- The Value of Young Bat Willow Trees. *H. P. Hutchinson*. (Jour. Bath and West and S. Counties Soc., Sixth Ser., vi (1931-1932), pp. 154-155.) [63.3412.]
- Gas Storage of Pork and Bacon. Part I: Preliminary Experiments. *E. H. Callow*. (Jour. Soc. Chem. Ind. (Trans. and Comm.), 51, 15 (April 8, 1932), pp. 116r-119r.) [63.752.]

Agricultural Education

- The Teaching of Agriculture in a County without a Farm Institute. *A. Gregg*. (Agric. Prog., ix (1932), pp. 136-143.) [37 (42).]
- The Teaching of Agriculture in a County with a Farm Institute. *W. B. Mercer*. (Agric. Prog., ix (1932), pp. 143-150.) [37 (42).]
- The Contribution of the County Adviser to the Development of the Poultry Industry. *E. E. Kidd*. (Agric. Prog., ix (1932), pp. 106-114.) [37: 6365.]

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- Reclamation and Cultivation of Peat Land in Lewis. Part III. *W. G. Ogg* and *A. Macleod*. (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 174-184.) [63.12; 63.142.]
- Studies on the Carbon and Nitrogen Cycles in the Soil. V: The Origin of the Humic Matter of the Soil. *H. J. Page*. (Jour. Agric. Sci., xxx, 2 (April, 1932), pp. 291-296.) [63.113.]
- Studies on the Carbon and Nitrogen Cycles in the Soil. VI: The Extraction of the Organic Nitrogen of the Soil with Alkali.

- R. P. Hobson and H. J. Page.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 297-299.) [63.113.]
- Studies on Calcium Cyanamide. I: The Decomposition of Calcium Cyanamide in the Soil and its Effects on Germination, Nitrification and Soil Reaction. *E. M. Crowther and H. L. Richardson.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 300-334.) [63.1671.]
- Studies on Calcium Cyanamide. II: Micro-biological Aspects of Nitrification in Soils under Varied Environmental Conditions. *B. K. Mukerji.* (Jour. Agric. Sci. xxii, 2 (April, 1932), pp. 335-347.) [63.1671.]
- Studies on Calcium Cyanamide. III: Storage and Mixing with Superphosphate. *H. L. Richardson.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 348-357.) [63.1671; 63.1672.]

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- The Maintenance of Healthy Stocks of Potatoes in England. *H. Bryan.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 358-365.) [63.512.]
- The Storage of New Potatoes. *A. M. Smith.* (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 202-204.) [63.512-198.]
- Influence of Size and Shape of Plots on the Precision of Field Experiments with Potatoes. *S. H. Justesen.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 366-372.) [37 (01); 63.512.]
- Experimental Error and the Field-plot Technique with Potatoes. *R. J. Kalamkar.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 373-385.) [37 (01); 63.512.]
- Notes on the Inheritance of Flower and Tuber Colour in the Potato. *A. P. Lunden.* (Jour. Gen., 25, 3 (April, 1932), pp. 339-358.) [675.1; 63.512.]
- Experiments on the Manuring of Sugar Beet on Acid Soils. *A. W. Ling and W. R. Muir.* (Jour. Bath and West and S. Counties Soc., Sixth Ser., vi (1931-1932), pp. 33-38.) [63.3433.]
- Recent Progress in Grassland Research. (a) Nutritional Aspects. *H. E. Woodman*; (b) Minerals. *W. Godden*; (c) Herbage Plants. *R. G. Stapledon*; (d) Botanical Analysis: (1) Methods. *R. A. Roberts*; (2) Present Value in Grassland Experiments. *F. R. Horne*; (e) Management. *J. A. Hanley.* (Agric. Prog., ix (1932), pp. 7-33.) [63.33; 63.33-16; 63.60433.]
- The Effect of Frequent Applications of Sulphate of Ammonia to Permanent Grassland in East Anglia. *F. Hanley.* (Agric. Prog., ix (1932), pp. 64-75.) [63.33-16.]
- Investigations into the Intensive System of Grassland Management by the Agricultural Research Staff of Imperial Chemical Industries, Ltd. VIII: The Comparative Digestibility and Feeding Value of Fresh and Artificially Dried Grass. *S. J. Watson and W. S. Ferguson.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 235-246.) [63.19831; 63.33; 63.60433.]
- Investigations into the Intensive System of Grassland Management by the Agricultural Research Staff of Imperial Chemical Industries, Ltd. IX: The Digestibility of Artificially Dried Hay. *S. J. Watson and W. S. Ferguson.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 247-250.) [63.19831; 63.33; 63.60433.]
- Investigations into the Intensive System of Grassland Management by the Agricultural Research Staff of Imperial Chemical Industries, Ltd. X: A Further Study of the Mineral Content of Intensively Treated Pasture. *W. S. Ferguson.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 251-256.) [63.33; 63.33-16; 63.60433.]

Investigations into the Intensive System of Grassland Management by the Agricultural Research Staff of Imperial Chemical Industries, Ltd. XI: The Effect of Nitrogen on the Yield, Composition and Digestibility of Grassland Herbage. *S. J. Watson, J. Procter and W. S. Ferguson.* (Jour. Agric. Sci., **xxii**, 2 (April, 1932), pp. 257-290.) [63.33; 63.33-16; 63.60433.]

Horticulture

Development of Horticulture in Scotland. *D. V. Howells.* (Scottish Jour. Agric., **xv**, 2 (April, 1932), pp. 132-146.) [63.41 (41); 63.5 (41).]

Tomato Growing Industry in Scotland. (Scottish Jour. Agric., **xv**, 2 (April, 1932), pp. 214-218.) [63.513.]

Experiments with Ultra-Violet Ray Glass. II. *M. A. H. Tinker.* (Contributions from the Wisley Laboratory, **LIX.**) (Jour. Roy. Hort. Soc., **LVII**, 1 (Jan., 1932), pp. 51-57.) [63.5-19.]

Factors governing Fruit Bud Formation. IX: A Study of the Relation between Leaf Area and Internode Length in the Shoots of the Worcester Pearmain Apple, as affected by Six Different Vegetative Rootstocks. *T. Swarbrick and K. C. Naik.* (Jour. Pom. and Hort. Sci., **x**, 1 (March, 1932), pp. 42-63.) [63.41.]

The Inflorescences of Apple Trees: Their Use in the Identification of Varieties. *R. T. Pearl.* (Jour. Pom. and Hort. Sci., **x**, 1 (March, 1932), pp. 19-26, pl. I and II.) [63.41.]

Experiments on the Storage of Apples in Artificial Atmospheres. II: Subnormal Oxygen Atmospheres with and without the Addition of Carbon Dioxide. *S. A. Trout.* (Jour. Pom. and Hort. Sci., **x**, 1 (March, 1932), pp. 27-34.) [63.41-198.]

Cool Storage Investigations, with particular reference to the influence of the maturity of Apples at Picking Time on Cool Storage Qualities. *G. B. Tindall.* (Jour. Dept. Agric. Victoria, **xxx**, 2 (Feb., 1932), pp. 95-104.) [63.41-198.]

Plant Pests and Diseases

Supplementary Note on Plum Bacterial Canker. *H. Wormald.* (Jour. Pom. and Hort. Sci., **x**, 1 (March, 1932), p. 64.) [63.23.]

Grafting as a Method for investigating a possible Virus Disease of the Strawberry. *R. V. Harris.* (Jour. Pom. and Hort. Sci., **x**, 1 (March, 1932), pp. 35-41.) [63.23; 63.41.]

Skin Spot and Blindness in Seed Potatoes. (Scottish Jour. Agric., **xv**, 2 (April, 1932), pp. 191-196.) [63.24.]

Notes on the Rusts of Basket Willows and their Control. *L. Ogilvie.* (Jour. Bath and West and S. Counties Soc., Sixth Ser., **vi** (1931-32), pp. 181-186.) [63.24.]

Progress Report on Vegetable Diseases. III. *L. Ogilvie and B. O. Mulligan.* (Jour. Bath and West and S. Counties Soc., Sixth Ser., **vi** (1931-32), pp. 167-181.) [63.24-51.]

Further Observations on the Black Spot Disease of Roses (*Diplocarpon Rosae* Wolf.) *D. E. Green.* (Contributions from the Wisley Laboratory, **LX.**) (Jour. Roy. Hort. Soc., **LVII**, 1 (Jan., 1932), pp. 58-62.) [63.24.]

Note on the Disease Resistance shown by Butcher's Disease Resister Cucumber to *Cercospora* Leaf Spot. *D. E. Green.* (Contributions from the Wisley Laboratory, **LXI.**) (Jour. Roy. Hort. Soc., **LVII**, 1 (Jan., 1932), pp. 63-64.) [63.24.]

The Control of Capaid Bugs on Black Currants. Field Experiments in 1931. *L. N. Staniland and O. L. Walton.* (Jour. Bath and West and S. Counties Soc., Sixth Ser., **vi** (1931-32), pp. 162-167.) [63.27.]

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NOTES FOR THE MONTH

FOLLOWING the notice appearing on page 314 of the last (July) issue of this JOURNAL, the Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland have given notice of their intention to issue revised Regulations to replace the Fertilizers and Feeding Stuffs Regulations, 1928, and a Draft of the revised Regulations has now been published (copies may be obtained from His Majesty's Stationery Office, Adastral House, Kingsway, W.C. 2, price 10d. or 11d. post free).

Fertilizers and Feeding Stuffs Act, 1928 : Revision of Regulations

culture for Scotland have given notice of their intention to issue revised Regulations to replace the Fertilizers and Feeding Stuffs Regulations, 1928, and a Draft of the revised Regulations has now been published (copies may be obtained from

The principal matters in the Regulations affected by the revision may be grouped, for convenience, under two heads : (a) the methods of sampling and analysis, and (b) alterations to the Schedules to the Fertilizers and Feeding Stuffs Act, 1928.

As regards (a) the provisions relating to the manner of taking samples have been rearranged and amended in certain respects, mainly in order to facilitate the work of the officials concerned. The methods of analysis have been amended by the adoption of the British Standard Test Sieve, Mesh No. 100, in place of the present prescribed sieve for the determination of the fineness of grinding of basic slag, &c. ; and also by the inclusion of a method of analysis for the determination of citric soluble phosphoric acid.

As regards (b) the fresh amendments are confined to the First, Second and Fourth of the Schedules to the Act.

It may be explained that the First and Second of the Schedules to the Act include the classes of articles in respect of which the seller is required under the Act to give to the purchaser a statutory statement, which has effect as a warranty, containing certain prescribed particulars. In the Fourth Schedule to the Act the names of the more commonly used fertilizers and feeding stuffs are defined, and the use in a statutory statement of any of these names constitutes a warranty that the article accords with the relative definition.

With one exception the present amendments to these Schedules relate to feeding stuffs, the exception being "Lime

mixtures," which, under the Draft Regulations, is now included amongst the fertilizers in the Second Schedule.

Alfalfa meal has been added to the Second Schedule, and has been defined in the Fourth Schedule as "Alfalfa (Lucerne) as grown, dried and ground, to which no other matter has been added."

The entry "Barley Meal" in both the First and Fourth Schedules is now replaced in the Draft Regulations by two entries, namely, "Barley Meal" and "Barley Meal, Grade II." These names are defined for the purpose of the Fourth Schedule, as follows :—

Barley Meal.—The meal obtained by grinding barley, as grown, which shall be the whole grain together with only such other substances as may reasonably be expected to have become associated with the grain in the field; the meal to contain not less than 96 per cent. pure barley.

Barley Meal, Grade II.—The meal, other than barley meal as defined above, obtained by grinding barley, as grown, which shall be the whole grain together with only such other substances as may reasonably be expected to have become associated with the grain in the field; the meal to contain not less than 90 per cent. pure barley.

The definitions, in the Fourth Schedule, of Bean Meal and Pea Meal have been amended to read as follows :—

Bean Meal. The meal obtained by grinding commercially pure beans of the species (1) *Vicia Faba* (synonym *Faba vulgaris*) or any of its varieties, commonly known as "horse bean," "field bean" or "broad bean"; or (2) *Phaseolus vulgaris*, the "true haricot bean" or any of its varieties, white or coloured.

Pea Meal.—The meal obtained by grinding commercially pure peas, as grown, of varieties of *Pisum sativum* or *Pisum arvense*.

The entries in the Schedules relating to feeding meat and bone products have been varied, the chief point, perhaps, being that the definitions of feeding meat meal and feeding meat and bone meal in the Fourth Schedule have been amended with the object of fixing minimum percentages of albuminoids (protein) in these articles. The new definitions read as follow :—

Feeding Meat Meal.—"The product, containing not less than 55 per cent. of albuminoids (protein) and not more than 4 per cent. of salt, obtained by drying and grinding animal carcasses or portions thereof (excluding hoof and horn) to which no other matter has been added."

Feeding Meat and Bone Meal. "The product, containing not less than 40 per cent. of albuminoids (protein) and not more than 4 per cent. of salt, obtained by drying and grinding animal carcasses or portions thereof (excluding hoof and horn) and bone, to which no other matter has been added."

It is proposed that the revised Regulations shall be brought into operation on September 1, 1932.

THE following note has been communicated by Mr. H. E. Woodman, M.A., Ph.D., D.Sc., of the School of Agriculture, Cambridge: The importance of an **Bone Charcoal as a adequate supply of minerals in the rations Source of Minerals** of farm animals is now generally recognized. For satisfactory development of the skeletal structure in young, growing animals, as well as for milk production in the lactating animal, the provision in the ration of a proper supply of lime and phosphoric acid is of primary importance. If the ration, as frequently happens, contains too little of these constituents, the deficiency may be made good by feeding a mineral supplement containing, among other inorganic materials, some form of tri-calcic phosphate, the form usually employed being sterilized feeding bone flour. It is the purpose of this note to consider the possibility of using bone charcoal, a by-product of the sugar refineries, as a substitute for feeding bone flour in such mineral supplements.

Chemical Nature of Bone Charcoal.—Bone charcoal, sometimes referred to as bone char or bone black, is the residue left from the burning of bones out of contact with air. It is employed in the process of refining raw sugar, the material remaining after use for this purpose being known as *spent* bone charcoal. Until recent years, this by-product has found employment in agriculture mainly as a phosphatic fertilizer; and has not been much used in this country for feeding purposes, possibly on account of its unattractive colour.

Bone charcoal is obtainable in five different grades: (1) Coarse Bone Charcoal Dust, which results from the sifting of stock bone charcoal and passes almost entirely through a 40 mesh sieve (aperture= 0.016 in.). A regular supply is available, something like 30 tons being produced weekly by one firm of sugar refiners. It contains from 9 to 10 per cent. of carbon and about 75 per cent. of lime phosphate. (2) Fine Bone Charcoal Dust, which is a finer sifting of stock bone charcoal and, in chemical composition, is very similar to the coarser quality. The supply is not so regular, however, and it is available in smaller quantities only. (3) Spent Bone Charcoal, consisting of stock bone charcoal which can no longer be used in the sugar-refining process on account of the deterioration of its decolorizing qualities. The supply is intermittent, but, from time to time, large quantities are available at the sugar refineries. At the time of writing, for example, one refinery has 1,400 tons of this grade on hand. Its carbon content is

as low as 3 to 4 per cent., whereas it contains as much as 85 per cent. of lime phosphate. It is the coarsest of the grades, 5 per cent. only passing through the 60-mesh sieve (aperture = 0.01 in.), compared with 60 and 85 per cent. in the cases of coarse charcoal dust and fine charcoal dust, respectively. (4) Gray Bone Charcoal, a grade that resembles spent bone charcoal in respect of fineness of division. It is not recommended for feeding purposes, being an accidental product caused by a broken kiln pipe and containing, in consequence, an admixture of fuel ash. The supply is somewhat irregular, but 5 to 10 ton lots are available occasionally for use as a fertilizer.

The accompanying data for the composition of coarse bone charcoal dust may be taken as representative of the above four grades, but it should be borne in mind that spent bone charcoal and gray bone charcoal contain less carbon and, consequently, a higher proportion of the other components. It will be noted that the material consists essentially of bone phosphate with some carbon, a little carbonate of lime and magnesia and a smaller amount of lime sulphate. Very small amounts of iron oxide, alumina and silica are also present. Within the grades, the supplies of material are said to display a good degree of uniformity as regards chemical composition, and all the grades are sterile and free from organic matter, having been carefully washed and heated in pipe kilns.

COMPOSITION OF COARSE BONE CHARCOAL DUST

	per cent.
Phosphoric acid (P_2O_5)	34.5
Lime (CaO)	46.4
Carbon	10.0
Iron oxide (Fe_2O_3)	0.4
Alumina (Al_2O_3)	0.7
Magnesia (MgO)	(trace)
Carbonate (CO_2)	1.7
Sulphate (SO_3)	0.3
Silica (SiO_2)	2.0
Moisture	1.8
Undetermined	2.2
	<hr/> 100.0

(Equivalent to 75 per cent. tri-calcic phosphate.)

In addition to these four grades there is now (5) White Bone Charcoal, produced by deliberately burning off most of the carbon from Spent Bone Charcoal, which it resembles in size of particle. It is grayish-white in colour and thus without the dark-colour drawback of grades 1 to 3, and is also free from the

objectionable ingredients (from the feeding standpoint) of grade 4 (Gray Bone Charcoal). The following analysis shows it to have the highest concentration of phosphates of all the grades :—

COMPOSITION OF WHITE BONE CHARCOAL

	<i>per cent.</i>
Phosphoric acid (P_2O_5)	39.9
Lime (CaO)	53.9
Carbon ..	0.8
Iron oxide (Fe_2O_3)	0.6
Alumina (Al_2O_3)	0.9
Magnesia (MgO)	trace
Carbonate (CO_3)	0.8
Sulphate (SO_3)	0.5
Silica (SiO_2)	1.7
Moisture ..	0.0
Undetermined	0.9
	100.0

(Equivalent to 87 per cent. tri-calcic phosphate.)

Use of Bone Charcoal for Feeding Purposes.—The foregoing account shows that bone charcoal contains a high percentage of lime phosphate, its content of this bone-forming material being from 20 to 30 per cent. higher than that usually found in edible bone flours. The spent char, in conjunction with salt and ground limestone, is fairly commonly used in America as a mineral supplement for farm animals and is said to give very satisfactory results. In this connexion, the interesting suggestion is put forward that bone char, as a consequence of its porous character and the presence of charcoal, may be useful in the animal economy in helping to regulate intestinal activities and thus prevent digestive disturbances.

The price of grades 1 to 4 is the same, varying, according to the quantities purchased, from £3 to £4 per ton, bagged ex refinery, loaded free on barge, or free on rail or road in minimum 5 or 6 ton truck or lorry.* Grade 5 is about £1 per ton more on account of the cost of production. The price, therefore, is considerably lower than that of feeding bone flour, and for that reason, as well as because of its high content of bone-forming constituents, the product is well worth a trial. Incidentally, its utilization in this manner would give a measure of encouragement to a home industry.

* According to data supplied by Mr. H. C. Siegfried de Whalley, A.M.I.Chem.E., F.I.C., chief chemist of one of Messrs. Tate & Lyle's sugar refineries, to whom the writer is indebted for most of the information contained in this note.

INVESTIGATION and research have led to great changes in farming practice, and at no time perhaps have farmers taken so deep an interest in the scientific side **New Developments** of their business. It is of particular **at Rothamsted** interest, therefore, to record that on June 21 the Minister of Agriculture inaugurated two important developments at the Rothamsted Experimental Station. A new range of buildings, designed by Mr. Walter Tapper, A.R.A., has been built, and the whole of the farm buildings and barns have been supplied with an extensive electrical installation designed for both routine and experimental work. This marks the final stage of a scheme under which, during the past few years, a change has been made from arable to mixed farming.

The new buildings, which contain a demonstration room for visitors and workrooms for the field staff, had become necessary owing to the increasing number of farmers and others directly concerned in agriculture who visit the field experiments. The depression in agriculture appears to have intensified the desire of farmers to see the Rothamsted results and to learn the lessons they teach. It had become an increasingly difficult problem to deal adequately with parties of visitors, especially on wet days; the new demonstration room will do much to solve it. Lectures will be given here, aided by suitable demonstrations and wall diagrams which have been specially prepared to illustrate the practical conclusions of the Rothamsted investigations. Provision has been made for frequent changing of the diagrams so that topical subjects and the latest results will always be found alongside the older work of the Station.

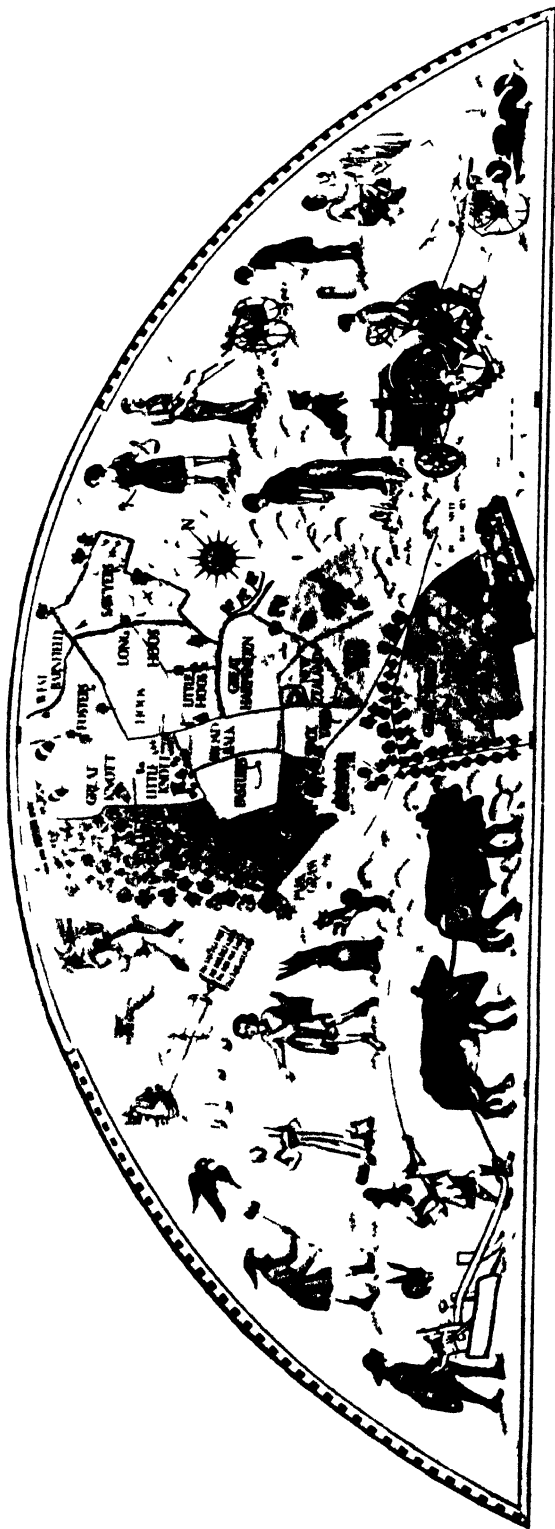
In addition to the demonstration room the new buildings include the Farm Director's office, a room for storing and mixing the manures for the experimental plots, a work-room for the experimental plots staff, with an outside weighbridge, and extensive drying and storage accommodation for samples from the plots. Each year over five hundred plots have to be dealt with, and concentration of the various control and checking operations within one central position specially designed for the purpose will greatly facilitate the work.

The electrical equipment will serve a two-fold purpose. The spread of electrification in rural areas will enable the farmer to use electricity for all the work in the buildings and barns that is at present done by some other source of power. The installation at Rothamsted has been designed, therefore,



Photos - C. H. Seegood

Two views of the Demonstration Room in the new buildings at Rothamsted. The lunette painting, shown in detail overleaf, is seen here in position with the surrounding moulding complete.



Landscape painting in the District of Columbia, at the Hawaiian Islands. In the center is a scale map of the Islands of the Hawaiian Islands. It is a map of the Hawaiian Islands, showing the main islands: Kure, Midway, Laysan, Lisianski, Pearl and Hermes, Midway, Laysan, Lisianski, Pearl and Hermes, Midway, Laysan, Lisianski, Pearl and Hermes. The former were taken from the collection of the Hawaiian Islands, at the Hawaiian Islands, at the Hawaiian Islands, at the Hawaiian Islands.

as a model for this class of work. Visitors will be able to see for themselves the type of electric wiring and the safety devices employed to prevent risk of fire. They will also see types of portable and fixed motors suitable for the many different operations carried on throughout the year.

The use of electric power for farm work is, however, only in its initial stages. Much investigation has to be made to ascertain the best conditions and methods of operation. The Rothamsted installation has therefore been designed to serve two purposes: (1), the demonstration of routine operations, as mentioned above, and (2), for necessary and desirable investigational work. It will now be possible to test new machines designed for use with electric power, and to investigate new methods. Detailed observation will be made of the performance of the machines and of their efficiency and running costs. In this way data will be obtained that will assist both manufacturers and users.

The erection of the buildings has cost £1,300, and was made possible by donations from many sources. The electrical installation was designed by the Agricultural Department of the General Electric Company, whose Chairman, Sir Hugo Hirst, has given generous financial aid towards the cost. The total cost was £2,400, of which one-half represents the cost of bringing power to the farm, and was generously borne by the North Metropolitan Electric Power Supply Company, who have provided facilities that will greatly assist the Station in carrying out the investigational part of the work.

* * * * *

THE following note has been communicated by Mr. A. W. Ling, M.Sc., N.D.A., Agricultural Officer and Chief Advisory Chemist, University of Bristol: Purple

Injury due to or Red Bartsia (*Bartsia odontites* Huds.,
Red Bartsia or *Euphrasia odontites* L.) is described
by Long* as a frequent weed in fields and

waste places and by roadsides. It is an annual with an erect, branched, wiry stem; and its pink, hairy and lipped flowers appear in July and August.

This weed has been noted frequently in poor grass fields, and attempts have been made to bring about its eradication by cutting the grass for hay. This procedure has been relatively successful in the West of England provided that the hay is cut very early. A case was investigated by the writer some

* H. C. Long: *Common Weeds of the Farm and Garden*, 1910.

time ago in which cows and calves were being fed on hay that had been cut very late from a field containing appreciable quantities of Bartsia. It was reported that since this hay had been introduced into the ration the calves had scoured violently and the cows to a less extent. Eventually a number of the calves died. The feeding of this particular hay was discontinued and the cows and remaining calves recovered. Investigation proved that the hard, wiry, mature Purple Bartsia, which was present in the hay in large quantities, was quite undigested by the animals and had set up such acute irritation of the walls of the stomach and intestines as to cause scouring of both young and adult stock, and the eventual death of the calves.

Occasionally, fields that contain this weed are cut over with the mowing machine quite late in the season, after the plant has reached maturity, and the grass is made into rough hay. In the light of the experience now available this procedure is not to be recommended, particularly if the hay is to be fed to young animals. An additional disadvantage is that re-seeding of the pasture with weed seeds is highly probable. Any farmer who desires to eradicate Purple Bartsia—or for that matter any other annual weed—from his pastures is strongly advised to cut the fields as early as possible, and if hard or wiry weeds are present to feed the resulting hay to adult stock and then only in small quantities along with good hay. In some instances, particularly where the percentage of weeds is very high and that of good grasses and clovers low, it may be wiser not to feed the material at all.

* * * * *

THE sixth annual competition in the judging of live stock open to students of county farm institutes in England and

Wales was held at the farm of Mr. Corbett

**Inter-Farm Roper, The Laurels, Lenborough, near
Institute Live Stock Buckingham, on Thursday, June 9, 1932.**

Judging Competition Mr. Roper has for long been recognized as an enlightened breeder of commercial dairy cattle.

The financial stringency prevented several counties from participating—only five institutes competed—but the competition was keen and the classes of stock (excepting perhaps the pigs) provided a searching test of the students' skill.

The Moulton Farm Institute (Northants), who were third in the 1931 competition, took first place and were closely followed by the Chadacre Agricultural Institute (Suffolk),

who were also runners-up in 1931. The Hertfordshire Institute of Agriculture, who were the winners last year, were third on this occasion.

The following classes of stock were judged :—

Dairy Shorthorn cows for dual purposes ; Shire horses as farm animals ; Middle White—Large Black crossbred gilts ; Half-bred ewes with their lambs ; and Light Sussex poultry.

There was a good attendance of visitors. The competition was followed by a luncheon at which the President (Mr. Mervyn Davies, who presented the cup to the winning team), the Vice-President (Mr. Gates), and other representatives of the N.F.U. spoke.

* * * * *

THE eleventh international cattle judging competition for Young Farmers' Clubs took place at the Royal Show, Southampton, on July 6, for possession

Young Farmers' Clubs : International Mail Gold Cup. The holders were America,

Dairy Cattle who again sent over their champion **Judging Contest** judging team (Oklahoma) to meet representative teams from England and

Northern Ireland. The English team had trained at Moulton Farm Institute.

For the first time in the history of the contest as many as eight rings of cows and heifers (four animals in each ring) were put up for judging, the breeds represented being Dairy Shorthorn, Friesian, Ayrshire, Guernsey and Jersey. Another innovation was the introduction of a microphone and loud-speakers to enable all to hear the reasons given by competitors for their placings ; this was a success qualified only by a complaint that when a certain lady was giving her reasons to the judges, speakers at a conference in a nearby pavilion were inaudible !

Professor J. A. S. Watson again acted as one of the judges, in association with Mr. Robert Hobbs and Mr. Robert Rae.

The Gold Cup was won by England after a most interesting contest which attracted large numbers of spectators throughout the day. The points awarded were as follow :—

(Maximum—1,800)

1. England	1,304
2. U.S.A.	1,187
3. N. Ireland	1,171

Two of the nine competitors were girls, and it is highly creditable that one of them succeeded by a substantial margin in obtaining first place in the individual judging.

The following were the individual scores :—

(*Maximum—600*)

1. Joyce Holland (England) ..	476
2. Cyril Browne (England) ..	425
3. Orville Siegenthaler (U.S.A.) ..	424
4. Brian McNabb (N. Ireland) ..	413
5. Forrest Fansher (U.S.A.) .. }	403
Doris Lee (England) .. }	
7. John Graham (N. Ireland) ..	390
8. Robert McCullough (N. Ireland)	368
9. Milford Brown (U.S.A.) ..	360

The *Daily Mail* again awarded silver medals to the members of the winning team and bronze medals to the members of the team occupying second place ; and the Royal Agricultural Society awarded a special certificate to the members of each team.

After the competition Professor Watson addressed the competitors and spectators, explaining the judges' placing of the various rings of cattle, and giving useful hints for competitors to bear in mind in judging dairy cattle.

The awards were presented by the President of the Society, Lord Mildmay of Flete, in the Grand Ring.

* * * * *

MANY factors have combined to develop rabbit-keeping from a profitable hobby into a specialized industry, with three important branches of fur, meat and wool

Rabbit-keeping production. During the War the shortage of food impelled many people to overcome the existing prejudices against the use of hutch-reared rabbits for table purposes, but, as £730,000 worth of rabbit meat was imported into Great Britain in 1931, and old prejudices have not returned to their pre-war intensity, there is a considerable market for the home-reared product.

Another prejudice that is fast disappearing is that which condemns as wearing-apparel the skin of one fur-bearing animal while approving that of another, but not necessarily rarer, animal. Apparently no distaste attaches to the use of Angora rabbit wool, but a steady market is only procurable for the best qualities.

The Ministry, realizing the possibilities of the various branches of this industry, has recently issued a Bulletin,* written by Professor J. N. Pickard of the Institute of Animal Genetics, University of Edinburgh, covering the subject of rabbit-keeping in all its phases, from the selection of breeds to the preparation of products for the market.

* Bulletin No. 50, *Rabbit-Keeping*, obtainable through any bookseller or from H.M. Stationery Office, price 6d. (7d. post free).

WINTER-SPRAYING TRIALS IN THE WEST MIDLANDS

E. E. EDWARDS, M.Sc.,

Harper Adams Agricultural College, Newport, Salop.

PREVIOUS experiments have indicated that winter washes consisting of Long Ashton tar oil, either alone^{1, 2*} or combined with a heavy paraffin or mineral oil^{3, 4} are the most effective in killing harmful insects on fruit trees on which Capsid Bug is present, and that, if properly applied, such sprays afford an economic means of controlling these pests. Complaints, however, have been received from growers in the West Midland Counties to the effect that they were unable to control Capsid Bug on apple trees by spraying with these washes, and that the spraying often resulted in considerable reduction of fruit spurs on certain varieties of apples.

Causes of Spraying Failures.—Many of these cases were investigated, and the cause of the failure could be attributed in a large number of instances to one or more of the factors dealt with below :—

(1) *Spraying at the Wrong Time.*—Many growers do not realize that trees must be in a dormant condition when sprayed with winter washes containing tar oils, that is, the buds should not be showing signs of swelling or of movement. The trees must also be dry when the wash or spray is applied, and if possible a dry spell of weather should be chosen so that the spray is not washed off immediately after its application. Further, spraying should not be carried out in frosty weather.

(2) *Incorrect Methods of Spraying.*—Many growers do not spray their trees thoroughly. It is most important that every portion of the tree should be covered with the spray, particularly the bud-bearing twigs, since most of the eggs are found thereon.

(3) *Unsuitable Sprays.*—In some districts, and notably in parts of Shropshire, some of the "hard waters" available for spraying are not suitable when used alone with some of the winter washes, for the emulsification of the mixture is broken down and a brown, tarry scum separates out. A wash containing tar-oil, when mixed with water, should give a milky fluid with practically no separation of dark oily drops.

In the course of these investigations, however, considerable evidence was obtained in support of the complaints

* For references, see page 420.

made by the growers. Some further corroboration was obtained in the 1929-30 winter spraying demonstrations, conducted by the writer in collaboration with the Horticultural Instructors for Shropshire and Staffordshire.

Field Experiments.—In order to try out the validity of the two complaints more extensively, the experiments described below were then undertaken, the primary object being to compare the efficiency of certain winter washes capable of destroying the eggs of Apple Capsid Bug, Sucker, Aphis and the Winter Moths, under conditions existing in the West Midland Province, without causing injury to the fruit and other buds.

Five varieties of apples and eight methods of treatment were used in these experiments carried out on a 40-acre plantation at the Co-operative Wholesale Society Fruit Farm at Roden, Shropshire.

Varieties Used.—These included Bismarck, Grenadier, Lane's Prince Albert, Newton Wonder and Worcester Pearmain. The trees chosen were sixteen years old and of the bush type, and interplanted with gooseberries.

Sprays Employed.—The following eight winter washes were applied to the respective plots as shown below (Series B-I) :—

- A. Unsprayed (controls).
- B. Long Ashton two-solution tar-oil wash at 10 per cent. strength (= L.A. Tar Oil).*
- C. Long Ashton modified tar-oil wash at 10 per cent. strength (= L.A.M. Tar Oil).
- D. Long Ashton tar-oil-heavy-paraffin wash at 10 per cent. strength (= L.A. Paraffin).
- E. Modified Long Ashton tar-oil-heavy-paraffin Wash A at 10 per cent. strength (= Mod. L.A. Paraffin A).
- F. Modified Long Ashton tar-oil-heavy-paraffin Wash B at 12½ per cent. strength (= Mod. L.A. Paraffin B).
- G. Mineral-oil emulsion at 7½ per cent., plus Long Ashton modified tar-oil wash at 5 per cent. strengths. These two washes were mixed together at time of spraying (Min. Oil. plus L.A.M. (7 : 5)).
- H. Two parts of mineral-oil emulsion plus one part Long Ashton modified tar-oil wash at 12½ per cent. combined strength. These two washes were supplied already mixed together (Min. Oil plus L.A.M. (2 : 1)).
- I. Mineral-oil emulsion at 10 per cent. strength (Min. Oil).

The origin and nature of these sprays were as follows :—

- B. A neutral tar-distillate of high boiling-point prepared according to the formula described by F. Tutin in the 1927 Annual Report of the Long Ashton Research Station.
- C. A one-solution wash of commercial origin ; essentially a modified form of Wash B.

* For convenience of reference the abbreviations in brackets are adopted in Tables I, II, III, IV.

- D. A mixture containing equal parts by volume of a high-boiling, neutral tar-distillate and a heavy paraffin ("Shell White Oil P.2") as described in this JOURNAL, August, 1930, p. 476.
E. A modified form of Wash D and prepared by a commercial firm.
F. Similar to Wash E, but of a different commercial origin.
G, H and I. A proprietary mineral-oil emulsion was used. The tar-oil wash in G and H was identical with Wash B and was obtained from the same source.

Lay-out of Experiment.—The experimental block of trees consisted of 20 rows, each row containing 32 trees of the same variety; there were four such rows per variety. These 20 rows had been planted without regard for variety sequence and in this respect were in a quite randomized order. The area was divided up in such a way that each variety included three plots of four trees under each kind of treatment together with eight similar plots left unsprayed as controls.

Application of Spray Fluids.—The washes were applied by means of a headland hand-power machine, working at the pressure of 100 to 120 lb. per sq. in. All the spraying was done personally by the writer so as to ensure uniformity of treatment for each tree.

Time of Application.—The spraying was carried out from February 18 to 25, at which time no sign of bud movement was visible on any of the varieties. The weather was dull, cloudy and calm except for an occasional gusty breeze. A little rain fell on the second and fourth days, but not until some three hours after the work had been completed, by which time the spray fluids had dried on the trees.

Measurement of Results.—Observations were made during the growing season on the appearance of each tree and on the occurrence of the different insect pests. The insects present were Apple Sucker, Aphis, Caterpillar and Capsid Bug.

Effect on Foliage.—Throughout the growing season, the difference in foliage between the sprayed and unsprayed trees was most marked. The trees on all the sprayed plots, particularly on those where Capsid Bug was controlled, carried much more foliage and their general health seemed higher than that of the trees on the unsprayed plots. Also, the individual leaves of the sprayed trees were considerably larger and of a deeper green.

Injury to Fruit Buds.—All the winter washes under experiment, with the exception of mineral-oil emulsion (Wash I) and the one consisting of two parts mineral-oil emulsion plus one part modified Long Ashton tar-oil (Wash H), resulted on some varieties in considerable destruction of fruit buds and in retardation of blossoming (see Table I). In such cases

gooseberries growing beneath the trees also suffered injury from these sprays. The development of the leaves surrounding the apple blossom trusses was, in many cases, completely inhibited, and it was found that the majority of these blossoms failed to fruit (see Fig. 1).

The system of marking employed for assessing the amount of spray damage was to judge each tree as a whole, 10 marks being given where the damage was severe, and zero where it was negligible from the practical standpoint. Moderate damage was given a corresponding intermediate mark. The results are expressed in Table I and the figures given represent the average damage for the 12 trees of each variety, for each of the eight washes.

It will be noted in Table I that there was a marked difference in the susceptibility of the varieties to spray injury; Newton Wonder and Lane's Prince Albert suffered the most injury, and Grenadier the least, whilst Bismarck and Worcester Pearmain were intermediate in this respect.

Apple Sucker and Aphis.—In none of the varieties under experiment were the control or unsprayed trees heavily infested with either of these two pests. The method adopted for recording results was to examine 125-135 trusses on each of three trees on the treated plots and on each of two trees on the control plots. Thus, for each variety, approximately 1,200 trusses were examined on the three plots under each kind of treatment and about 2,000 trusses on the unsprayed ones. A figure 10 was allotted where every flower truss or young shoot was infested with the pest, with graduations down to 0 where all the trusses and shoots were entirely free from infestation. The actual figures obtained in this way on the different unsprayed plots varied from 3 to 5 in the case of Apple Sucker and 1 to 3 for Aphis. Mineral-oil emulsion alone gave incomplete control on all varieties, the figures being 2 to 4 and 0.5 to 2 for Apple Sucker and Aphis, respectively. All the other spray fluids left the trees, from the practical standpoint, entirely free from both pests.

Caterpillars.—The caterpillar attack on the control plots of all varieties was exceptionally severe, and the damage done, coupled with that due to Apple Capsid Bug, resulted in very light crops on the unsprayed trees. An analysis of the caterpillar population on the unsprayed trees showed nearly 90 per cent. Winter Moth Caterpillar, the remainder being various kinds of Tortricid caterpillars. The proportion on the sprayed

Spray	Index of plots.	Variety of apple				Average for all varieties
		Grenadier	Bismarck	Worcester	Lane's	Newton
L. A. Tar-oil ..	B 1-3	*	6	6	7	10
L. A. M. Tar-oil ..	C 1-3	3	5	7	8	9
L. A. Paraffin ..	D 1-3	4	3	3	6	6
Mod. L. A. Paraffin A ..	E 1-3	2	3	3	5	6
Mod. L. A. Paraffin B ..	F 1-3	0	4	7	8	10
Min. Oil plus L. A. M. (7:5)	G 1-3	4	6	5	6	8
Min. Oil plus L. A. M. (2:1)	H 1-3	2	3	0	0	0
Min. Oil emulsion ..	I 1-3	0	0	0	0	0
Average for all sprays ..		1.9	3.4	3.9	5.0	6.1

*These figures are worked out to the nearest whole number.

System of marking :—10 = Severe damage. 5 = Moderate damage. 0 = Negligible damage.

TABLE II.—PERCENTAGE NUMBER* OF TRUSSES ATTACKED BY CATERPILLAR.

Spray	Number of trusses examined (approx.)	Variety of apple				Average for all varieties
		Newton	Bismarck	Worcester	Lane's	Grenadier
Control (unsprayed) ..	2,000	78	64	85	60	80
L. A. Tar-oil ..	1,200	13	5	10	7	12
L. A. M. Tar-oil ..	1,200	16	7	12	6	8
L. A. Paraffin ..	1,200	12	6	9	6	4
Mod. L. A. Paraffin A ..	1,200	16	5	15	5	10
Mod. L. A. Paraffin B ..	1,200	10	4	7	2	9
Min. oil plus L. A. M. (7:5)	1,200	14	4	12	5	8
Min. oil plus L. A. M. (2:1)	1,200	14	4	13	3	4
Min. oil emulsion ..	1,200	20	11	17	14	15

* All percentages are worked out to the nearest whole number.

plots was very similar. The system adopted for recording results was to examine 125 to 130 trusses on each of three trees on the treated plots and on each of two trees on the control plots, making a record of every truss showing signs of damage by caterpillar. In this way for each variety approximately 1,200 trusses were examined on the three plots under each kind of treatment and about 2,000 trusses on the unsprayed ones. The results are tabulated in Table II.

Examination of the figures in Table II shows that all the spray fluids used in the trials gave, on every variety, an effective commercial control of all caterpillars present in the egg stage at the time of application. The mineral-oil emulsion reduced the caterpillar rather less than the other spray fluids. The small differences in the degree of control given by washes other than the mineral-oil emulsion were probably due largely to experimental error and local differences in the distribution of the caterpillar, and not to the superiority of any particular wash.

Apple Capsid Bug.—No counts were made of the number of marked shoots, but the entire crop of apples was picked from each plot separately in the autumn and sorted carefully,* according to the amount of Capsid markings present, into four divisions :—

- (1) Clean, i.e., entirely free from Capsid injury.
- (2) Trace, i.e., with up to three small Capsid markings. All these were sent to market.
- (3) Moderate, i.e., with more than three small Capsid markings, or one or more large marks. Only about 20 per cent. of these were suitable for marketing.
- (4) Bad, i.e., distorted, cracked, or $\frac{1}{2}$ or more of whole surface marked.

The average total yield per tree and the percentage by weight in each grade under each kind of treatment are set out in detail in Tables III and IV.

It will be seen, from Tables III and IV, that unsprayed or control plots of all varieties gave the least weight of fruit per tree. This very low yield of the control plots is chiefly attributable to attacks of Winter Moth Caterpillar (see Table II) assisted by the Apple Capsid Bug (see Tables III and IV). The variation in the yield of the various sprayed plots is due in large measure to Apple Capsid Bug attacks coupled with spray damage to the fruit buds (see Table I).

The unsprayed plot (Table IV, Plot A), with an average for all varieties of only 11 per cent. clean apples, shows that

* All the grading was carried out by the same two persons.



FIG. 1.—Illustrates the character of the damage often occurring on plots sprayed with winter washes consisting wholly, or to a large extent, of tar oil. *Left hand specimen* sprayed with a winter wash consisting of two parts mineral oil emulsion plus one part modified Long Ashton tar oil, undamaged. *Right hand specimen* sprayed with a winter wash consisting entirely of modified Long Ashton tar oil, leaves surrounding the blossom trusses completely inhibited.

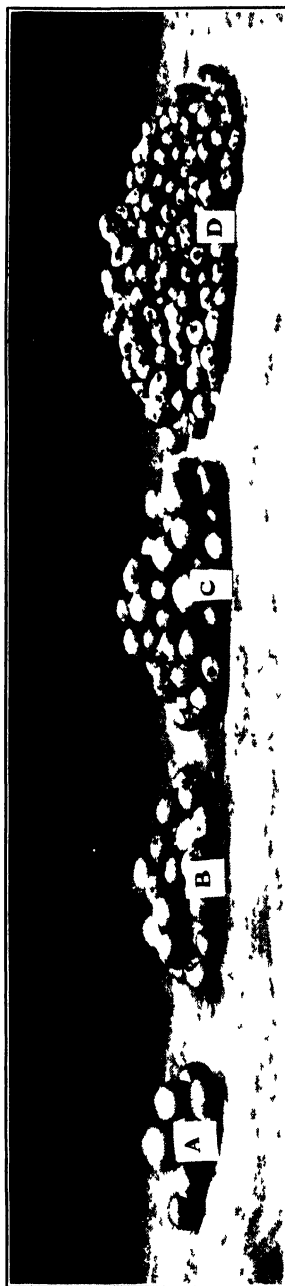


FIG. 2.—Total fruit picked from four Lane's Prince Albert trees sprayed with a white wash consisting of two parts mineral oil emulsion plus one part modified Long Ashton talc. The fruit graded according to the amount of Capsid Bug markings.—A = clean; B = trace; C = moderate; D = severe.

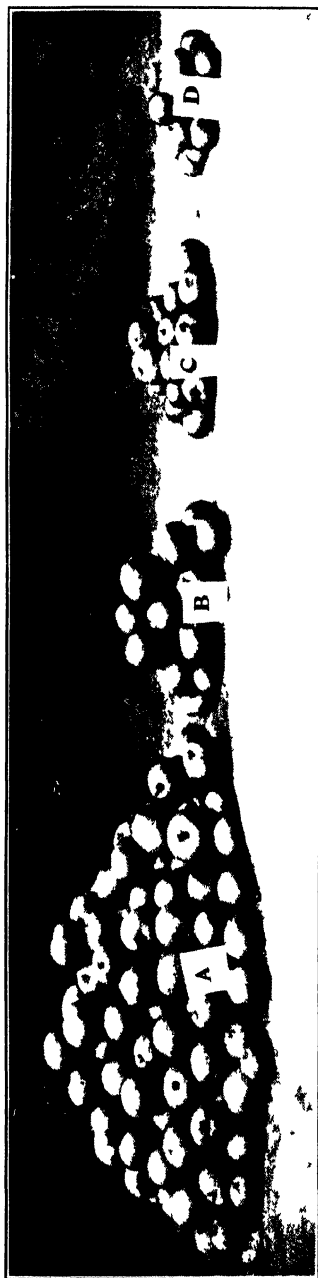


FIG. 3.—Total fruit picked from four Lane's Prince Albert trees sprayed with a white wash consisting of two parts mineral oil emulsion plus one part modified Long Ashton talc. The fruit graded and marked as in Fig. 2.

the infestation of Apple Capsid Bug was exceptionally severe.

An examination of Tables III and IV as regards Capsid Bug damage to the fruit on the various sprayed plots reveals that neither the Long Ashton two-solution tar-oil wash (Plots B) nor the Modified Long Ashton tar-oil wash (Plots C) used gave a satisfactory control of the Apple Capsid Bug. Of these two washes, the former gave the better result, but it produced on an average for all the varieties only 26 per cent. of clean apples. The best control of the Apple Capsid Bug was obtained by the use of mineral-oil emulsion alone (Plot I) which gave on an average for all varieties 72.2 per cent. clean apples and only 3.2 per cent. badly marked. The next most efficacious wash was the one consisting of two parts mineral oil-emulsion plus one part Long Ashton modified tar-oil (Plot H). This combined wash gave on an average for all varieties 68.1 per cent. clean apples and only 3.3 per cent. badly marked. The other four combined washes used (Plots D, E, F, G) were rather less successful in controlling the Apple Capsid Bug.

Summary.—I. Failure to control Capsid Bug has been investigated. It is suggested that in a large number of cases such failure is due to one of the following causes :—

1. Spraying at the wrong time.
2. Incorrect methods of spraying.
3. Unsuitable spray fluids.

II. Field experiments were carried out with eight different types of spray fluids. These sprays were tested on five different varieties of apples. The salient points in connexion with the results of these experiments are :—

1. Apple Sucker and Aphis were completely controlled by all sprays containing Long Ashton tar-oils, less effectively by mineral-oil emulsion used alone.
2. In the case of Caterpillars, commercial control was given by all spray fluids. Mineral-oil emulsion gave slightly inferior control to the other sprays.
3. Crop increases, up to 600 per cent., were obtained in some cases at a very small cost compared with the value of the increased crop.
4. Sprayed trees, particularly those on which Capsid Bug was controlled, made a very luxuriant leaf growth : thus the benefits from successful spraying will extend into subsequent years.
5. Some evidence was obtained to indicate that spray fluids consisting entirely, or to a large extent, of tar-oil may cause, on some varieties of apples, considerable injury to fruit buds and to gooseberries growing beneath. No damage was caused in these experiments by either mineral-oil emulsion at a concentration of 10 per cent. or the mixture of two parts mineral-oil emulsion plus one part modified Long Ashton tar-oil wash at a concentration of 12½ per cent.
6. Long Ashton tar-oil sprays, however useful as a precaution against Apple Sucker, Aphis and Caterpillar, have not, in the

TABLE III.—EXTENT OF CAPSID ATTACK AFTER VARIOUS SPRAYS.

Variety of apple	Spray	Index of plots	Weight of apples per tree	Percentage weight of apples			
				Bad markings	Moderate markings	Slight markings	Clean
Lane's Prince Albert	Control (unsprayed)	A 1—8	lb.				
	L. A. Tar-oil ..	B 1—3	10	47.6	23.7	12.8	15.9
	L. A. M. Tar-oil ..	C 1—3	27	30.7	20.9	10.4	38.0
	L. A. Paraffin ..	D 1—3	25	30.6	19.0	8.1	42.3
	Mod. L. A. Paraffin A ..	E 1—3	32	10.2	12.0	13.5	64.3
	Mod. L. A. Paraffin B ..	F 1—3	36	3.8	14.0	13.8	68.4
	Min. oil plus L. A. M. (7:5)	G 1—3	30	7.0	18.4	13.6	61.0
	Min. oil plus L. A. M. (2:1)	H 1—3	34	6.2	18.5	12.3	63.0
	Min. oil emulsion ..	I 1—3	38	1.1	9.8	9.8	79.3
			42	3.0	9.0	12.2	75.8
Worcester Pearnain	Control (unsprayed)	A 1—8	2	63.4	26.9	7.1	2.6
	L. A. Tar-oil ..	B 1—3	4½	31.4	36.1	10.3	22.5
	L. A. M. Tar-oil ..	C 1—3	4½	42.5	25.5	15.5	17.0
	L. A. Paraffin ..	D 1—3	6	10.4	10.5	11.6	67.5
	Mod. L. A. Paraffin A ..	E 1—3	5½	6.4	16.1	12.9	64.6
	Mod. L. A. Paraffin B ..	F 1—3	5½	9.8	12.9	12.9	64.4
	Min. oil plus L. A. M. (7:5)	G 1—3	5	5.0	15.0	10.0	70.0
	Min. oil plus L. A. M. (2:1)	H 1—3	7½	1.5	6.2	18.5	73.8
	Min. oil emulsion ..	I 1—3	7½	3.1	6.2	9.4	81.3

Bismarck	Control (unsprayed) L. A. Tar-oil .. L. A. M. Tar-oil .. L. A. Paraffin .. Mod. L. A. Paraffin A .. Mod. L. A. Paraffin B .. Min. oil plus L. A. M. (7:5) Min. oil plus L. A. M. (2:1) Min. oil emulsion ..	A 1-8 B 1-3 C 1-3 D 1-3 E 1-3 F 1-3 G 1-3 H 1-3 I 1-3	2 16 20 30 28 27 30 33 31	75-6 69-6 61-6 5-0 13-5 6-0 10-0 6-7 4-7	13-7 4-3 16-6 17-0 25-3 20-4 17-3 20-7 19-1	3-1 8-7 11-1 17-0 14-7 14-6 10-0 14-2 17-1	7-6 17-4 61-0 46-5 59-0 62-7 58-4 59-1
Newton Wonder	Control (unsprayed)	A 1-8	8	41-4	27-1	11-4	20-1
	L. A. Tar-oil ..	B 1-3	28	27-6	29-8	18-4	25-0
	L. A. M. Tar-oil ..	C 1-3	26	30-4	40-1	13-0	16-5
	L. A. Paraffin ..	D 1-3	46	13-2	19-2	12-0	55-6
	Mod. L. A. Paraffin A ..	E 1-3	41	14-0	12-3	14-5	59-2
	Mod. L. A. Paraffin B ..	F 1-3	37	12-9	9-6	22-5	55-0
	Min. oil plus L. A. M. (7:5)	G 1-3	37	7-2	18-6	17-9	58-3
	Min oil plus L. A. M. (2:1)	H 1-3	55	4-0	17-6	17-6	60-8
	Min. oil emulsion ..	I 1-3	60	2-0	12-4	12-8	72-8

TABLE IV.—EXTENT OF CAPSID ATTACK AFTER VARIOUS SPRAYS. AVERAGE FOR ALL VARIETIES.

Spray	Index of plots	Weight of apples per tree	Percentage weight of apples		
			Bad markings	Moderate markings	Slight markings
Control (unsprayed) ..	A	lb. 5	57-0	22-9	8-6
L. A. Tar-oil ..	B	19	39-7	22-7	11-9
L. A. M. Tar-oil ..	C	19	48-7	17-8	11-8
L. A. Paraffin ..	D	28	9-7	14-7	13-5
Mod. L. A. Paraffin A ..	E	27	9-4	16-9	14-0
Mod. L. A. Paraffin B ..	F	25	8-9	15-4	15-9
Min. oil plus L. A. M. (7:5)	G	26	7-1	17-3	12-6
Min oil plus L. A. M. (2:1)	H	33	3-3	13-6	15-0
Min. oil emulsion ..	I	35	3-2	11-7	12-9
					Clean
					11-5
					25-7
					21-7
					62-1
					59-7
					59-8
					63-0
					68-1
					72-2

circumstances described, proved of much value against Apple Capsid Bug.

7. Mineral-oil emulsion at a concentration of 10 per cent., though less efficient than Long Ashton tar-oil washes against Apple Sucker, Aphis and Caterpillars, gave excellent control of Apple Capsid Bug.
8. Sprays consisting of a mixture of heavy-paraffin or mineral-oil emulsion and modified Long Ashton tar-oil wash proved the most promising as general winter washes for the control of insects, including the Capsid Bug, on apple trees. Of these sprays, a mixture of two parts mineral-oil emulsion plus one part modified Long Ashton tar-oil wash at a concentration of 12½ per cent. gave the best results.

Conclusions.—Of the eight winter washes that have been tested, a wash consisting of two parts mineral oil emulsion plus one part modified Long Ashton tar-oil wash has proved easily the most effective as a general winter wash for the control of insects on apple trees on which Capsid Bug is present. This wash was applied at a concentration of 12½ per cent. and at this strength caused no injury to the apple fruit buds or to the gooseberries growing beneath.

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LUCERNE IN ENGLAND AND WALES

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THE area under lucerne (*Medicago sativa* L.) in England has undergone great changes in recent years. Fig. 1 shows the acreages of lucerne and of the total arable land in England and Wales from 1904 to 1931. In the decade preceding the War, the lucerne acreage was maintained at between 53,000 and 65,300 acres, but, from 1916 to 1919, it fell rapidly to 38,761 acres, probably on account of the increased utilization of arable land for corn crops at this time. After 1919, a sharp reaction in favour of lucerne-growing set in, so that the acreage regained the pre-War level by 1923 and reached 64,615 acres in 1924. From that time, however, there was a rapid decline in lucerne-growing until, in 1929, it had fallen to 35,783 acres, the lowest figure during the period under review. The fall in

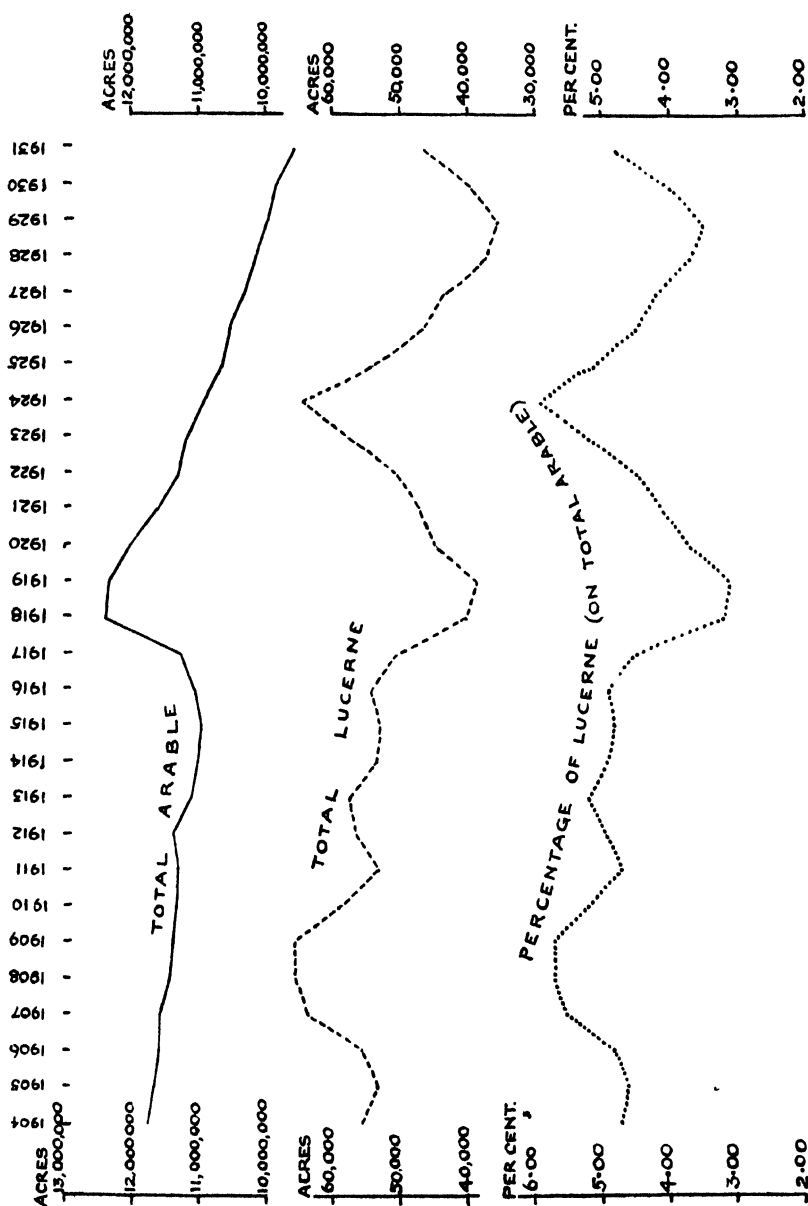


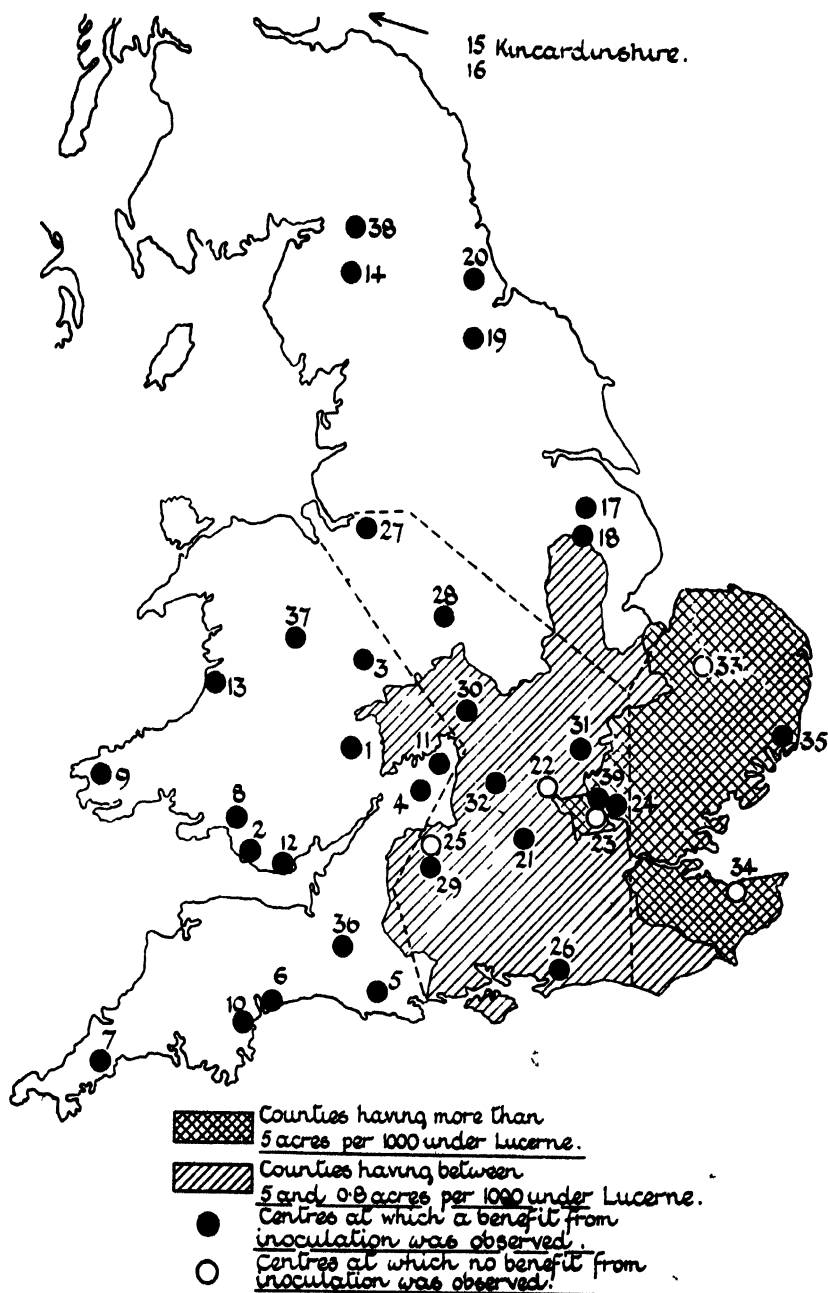
FIG. 1.—Acreage of Lucerne and of total arable land in England and Wales, from 1904 to 1931.

acreage under lucerne from 1924 to 1929 was relatively more rapid than that of the total arable area: in 1924, 0.59 per cent. of this area was under lucerne, but in 1929 only 0.36 per cent.

Nearly 70 per cent. of the lucerne acreage is contributed by the south-eastern counties, where the crop has been grown since its introduction into the country in the seventeenth century. The frequent failures with the crop in other districts had been attributed to unsuitable climatic and soil conditions; but there was some evidence that absence from the soil of the appropriate variety of the nodule organism might be an important limiting factor, which could be removed by a suitable "inoculation" method. Seed "inoculation" consists in applying to the seed-coat a culture of the appropriate nodule organism, to ensure that bacteria ready to infect the seedling root shall be present in the soil. Investigations carried out at Rothamsted resulted in the development of an improved "inoculation" technique. A series of field trials (Thornton and Gangulee, 1926) to test the application of this technique to lucerne were carried out from 1924 to 1928 (Thornton, 1929). The trials were carried out at 39 centres distributed over Great Britain, and were made with the help of grants from the Royal Agricultural Society. Their object was to discover whether, by using inoculated seed, the area over which lucerne could be grown successfully might be extended.

The data obtained from these trials made it possible to divide Great Britain into districts according to the response given by lucerne to inoculation. This division is shown in Fig. 2 by broken lines.

In the south-eastern district, comprising East Anglia, Kent, and East Sussex, the uninoculated lucerne usually develops sufficient nodules, so that inoculation is unnecessary. In the northern and south-western districts, on the other hand, benefit from inoculation was obtained in every trial. The effects of inoculation in these districts usually persisted as long as the crop stood, and the uninoculated crop often failed entirely. In the midland and south-central district, inoculation was usually beneficial. In many instances, this benefit showed itself only during the first year, but, even then, the effect is important, this being a critical period in the growth of lucerne. It is, therefore, always advisable to inoculate lucerne in all parts of England outside the south-eastern district, save where it is to be sown on land that has previously carried the crop successfully.



LUCERNE INOCULATION EXPERIMENTS.

[From "Jour. Agric. Science."]

FIG. 2.

The next problem was to determine whether the successful growth of lucerne could be extended in the south-western and northern districts by sowing inoculated seed, or whether some other limiting factor would render this impracticable. Cultures were, therefore, sent to some 200 farmers distributed over Great Britain, and reports as to the success or failure of the resulting crops were obtained from them. Fig. 3 shows the results of this test.

The area south-east of the broken line is taken as that over which lucerne is at present extensively cultivated. In the area outside this district, the percentage of successes to failures is not significantly lower than in the south-east. It appears, therefore, that climatic and soil conditions allow a considerable extension of the area of lucerne cultivation with inoculated seed, and that, in the past, absence of the appropriate nodule bacteria from the soil has been the principal limiting factor.

During the course of the trials, interest aroused among farmers made it necessary to issue the bacterial cultures on a practical scale. In 1928 and 1929, cultures were issued from Rothamsted, but, by 1930, the resources of a research institute could no longer cope with the demand, and the commercial issue of cultures was handed over to the firm of Allen & Hanburys, Ltd., Three Colt Lane, London, E. 2, acting under supervision from Rothamsted. Fig. 4 shows the number of cultures issued from Rothamsted in 1928 and 1929 and by Messrs. Allen & Hanburys within the past two seasons.

The use of inoculated seed has already begun to extend the cultivation of lucerne. The number of cultures issued in the first two years was insufficient to stem the fall in acreage under lucerne, but in two seasons ending June 1, 1931, there was an increase of 10,337 acres, although during this period the total arable acreage has continued its fall. Fig. 5 shows the total acreage under arable crops and under lucerne for the past four years, and the approximate acreage sown each year with inoculated lucerne. This has been calculated from the number of cultures issued by assuming a rate of sowing of 20 lb. of seed to the acre, one culture being sufficient to treat 14 lb. of seed. During 1930 and 1931, about 11,500 acres have been sown with inoculated seed. (See Fig. 5, p. 427.)

The areas in which, by the use of inoculation, lucerne cultivation might be extended are those outside the south-eastern district. Table I shows the acreage under lucerne in the south-eastern counties and in the remainder of England and Wales during the past four years; also lucerne in this

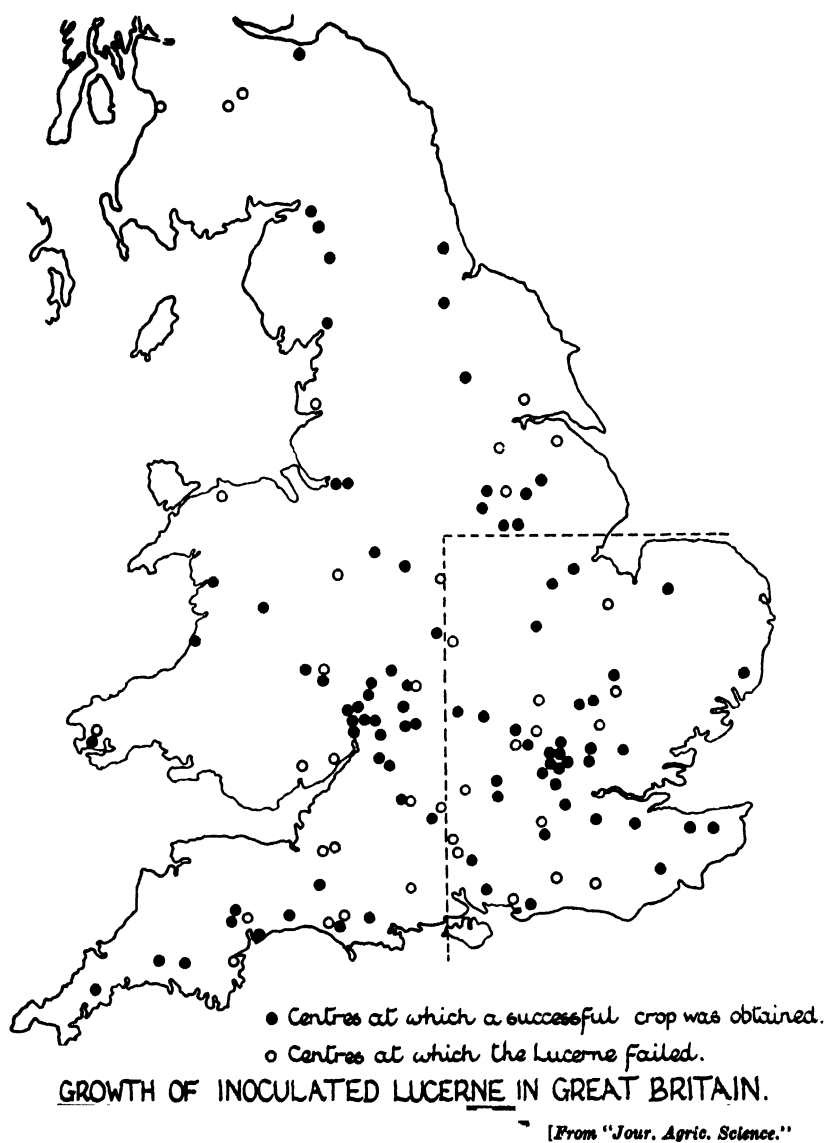


FIG. 3.

latter area as a percentage of the total. There has been a steady increase in the percentage of the lucerne acreage contributed by the country outside the south-eastern portion.

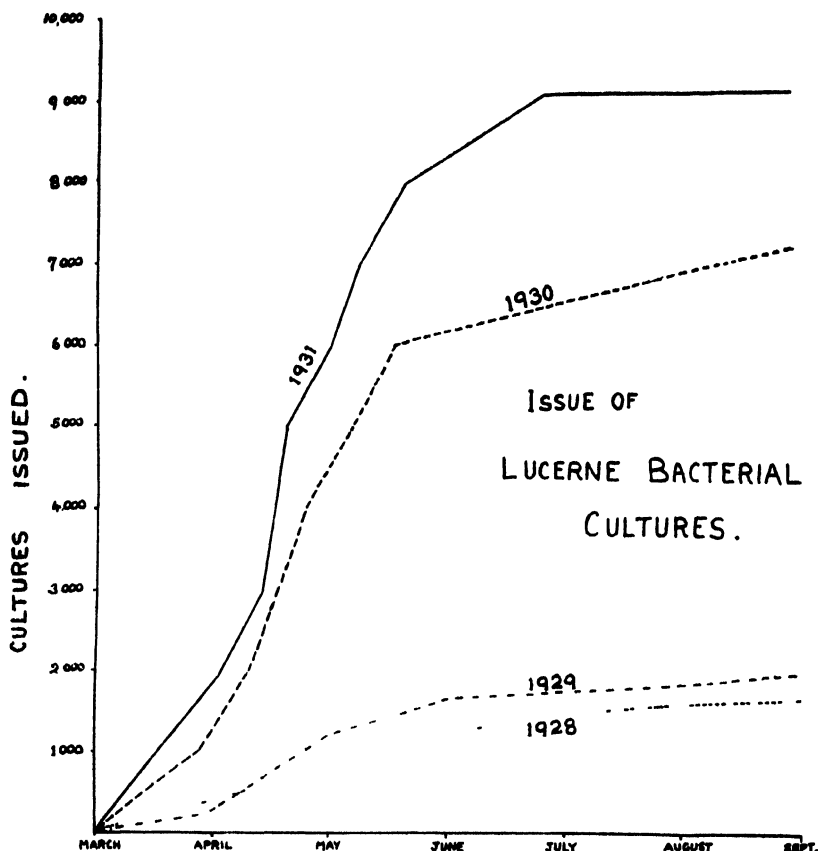


FIG. 4.

TABLE I

	1928	1929	1930	1931
A. Total lucerne acreage in England and Wales ..	37,104	35,783	39,781	46,120
B. Lucerne acreage in south-eastern counties..	25,809	24,409	26,459	29,740
C. Lucerne acreage in remaining counties ..	11,295	11,372	13,322	16,380
D. C as a percentage of A ..	30.4	31.8	33.5	35.5

Table II gives a comparison of the lucerne acreage for 1928 and 1931 in the districts shown in Fig. 2 and in Wales.

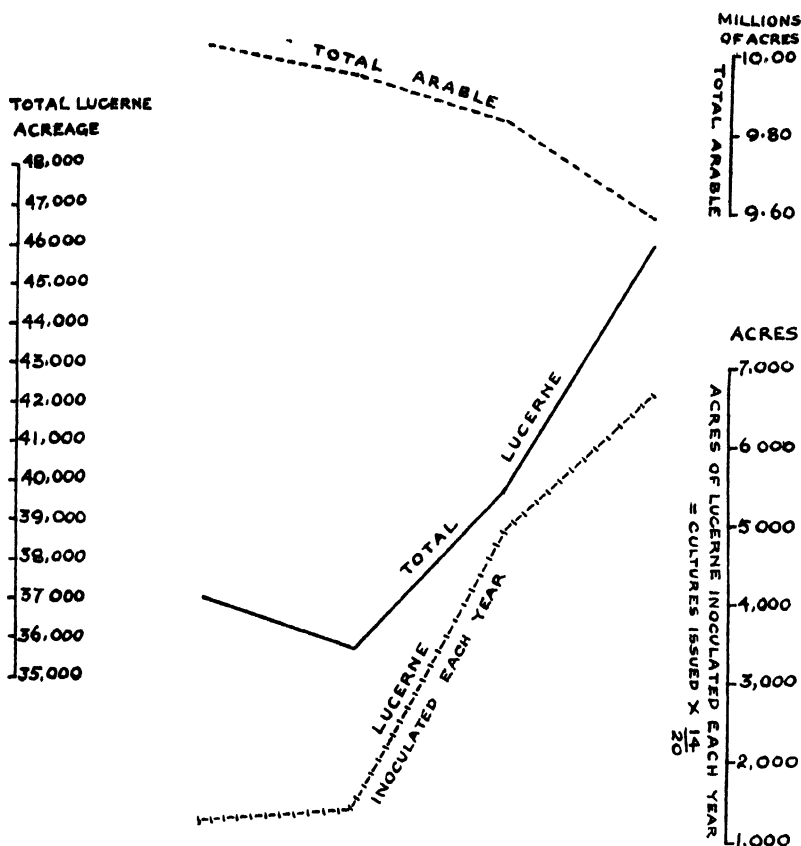


FIG. 5.—Total acreage under arable crops and under lucerne for the past four years.

TABLE II.

Area	Acreage 1928	Acreage 1931	Increase	Percentage increase
England and Wales	37,104	46,120	9,016	24.3
South-eastern counties ..	25,809	29,740	3,931	15.2
Midland and south-central counties	7,423	11,720	4,297	57.9
South-western counties ..	1,678	2,350	672	40.0
Northern counties	2,035	2,150	115	5.7
Wales	159	160	1	0.6
Total excluding south-eastern counties	11,295	16,380	5,085	45.0

In Wales and in the northern district there has been no appreciable increase, indicating that the sowing of inoculated lucerne has not been taken up in those areas. In the midland and south-western counties of England, on the other hand, there have been increases of 57.9 per cent. and of 40 per cent.

respectively, as compared with the south-eastern counties, which show an increase of only 15·2 per cent. This relatively rapid increase in lucerne growing in the midland, south, and south-west areas shows that the inoculation method is beginning to achieve its object by extending the cultivation of the crop in areas responsive to the use of inoculated seed.

ACKNOWLEDGMENT.—The laboratory research, which led to the above-mentioned method of lucerne-seed inoculation, was carried out at Rothamsted Experimental Station in the laboratory founded by the late Mr. James Mason, and the cost of the work was defrayed by the grant from the Ministry of Agriculture. The field trials carried out to test the method were rendered possible by grants from the Royal Agricultural Society of England and by the assistance of numerous experimenters.

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THE INFLUENCE OF MAIZE GERM ON THE QUALITY OF BACON

The following article is a report on co-operative experiments carried out by The Animal Nutrition Research Institute, Cambridge; The Harper Adams Pig-Feeding Experimental Station; and The Chemical Research Division of the Ministry of Agriculture for Northern Ireland.

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THE problem of reconciling the liberal use of maize in pig-feeding with the production of bacon of high quality has long occupied the attention of investigators, especially in Canada and in the United States, where swine husbandry is in large measure subsidiary to the growing of maize. It is the common experience of curers that liberal feeding of maize induces an undesirable softness of the bacon-fat, which investigators have correlated with a high proportion of olein in the fat. This suggests that the primary cause of the trouble may possibly lie in the richness of the maize in oil. Average samples of the grain will contain about 4 per cent. of digestible oil, so that a pig eating daily 4 lb. of a ration containing 25 per cent. of maize will be assimilating two-thirds of an ounce of maize oil per day. This oil is present mainly in the "germ" of the grain, by the removal of which a "degermed" maize meal containing little more than 1 per cent. of digestible oil can be obtained. Such a meal might, therefore, be expected to produce a better quality of pork- or bacon-fat than the

ordinary meal, though possibly at the expense of some lowering of feeding value of the maize as measured by the rate of increase in live-weight.

The commercial importance of the problem is such as to warrant careful investigation, and as no information on the relative merits of "whole" and "degermed" maize appeared to be available, the scheme of experiments here reported upon was drawn up by the Pig Feeding Research Committee* of the Ministry of Agriculture, and carried through at three centres in the spring and summer of 1928.

General Plan of Experiments.—For the purposes of the experiments it was necessary to secure supplies of maize meal (whole) and maize meal (degermed) coming from the same consignment of maize, and for these we were indebted to Messrs. Uveco Cereals, Ltd., Liverpool, whose co-operation made it possible to include in the experiments comparisons of cooked (flaked) and raw maize, and of yellow and white maize.

The full scheme of experiment as finally adopted provided for the following lots :—

- Lot I. Flaked Yellow Maize (including germ).
- Lot II. " " " (degermed).
- Lot III. Raw Yellow Maize Meal (including germ).
- Lot IV. Flaked White Maize (degermed).

At only one centre (Harper Adams) did it prove possible to provide all the four lots. At this centre a fifth lot was also added, receiving raw white maize meal, but as this was of different origin from the white maize used for Lot IV the results with this lot are not strictly comparable with the rest. At Cambridge the experiment comprised only Lots I and II, which were compared with a third lot receiving barley meal. In the Northern Ireland experiments Lots I, II and III were included.

The feeding period was divided roughly into three sub-periods, with rations as follows :—

<i>Live-Weight</i>	<i>Sharps</i>	<i>Barley</i>	<i>Maize</i>	<i>Soya Meal</i>
lb.	%	%	%	%
30—70	40	30	15	15
70—140	30	30	30	10
140 upwards	15	40	40	5

Divergencies in points of detail from this general scheme are dealt with in the reports on the separate experiments.

In all cases a supplementary mineral mixture, prescribed by the Rowett Research Institute, was given with the above rations.

* Under the chairmanship of the late Prof. T. B. Wood.

It will be clear that, apart from small differences in the total weights of food consumed, the only differences in the feeding of the lots were in the kind of maize used.

The diagnosis of the effects of the feeding upon the quality of the product presented considerable difficulties, and reliance had to be placed primarily upon careful inspection both of the fresh meat and the cured carcasses. An effort was also made to secure a variety of independent opinions by distributing the pigs from each centre between different curers. The conclusions from inspection were also checked by chemical examination (Iodine Values and Refractive Indices) of representative samples of the fats, taken in accordance with a prescribed method of sampling. The chemical composition of the various kinds of maize used, based on samples taken at the Harper Adams College, is given below :—

COMPOSITION OF FOODS					
	<i>Flaked whole yellow maize</i>	<i>Flaked degermed yellow maize</i>	<i>Raw yellow maize</i>	<i>Flaked white maize</i>	<i>Raw white maize</i>
	%	%	%	%	%
Moisture	14.4 (12.3)*	14.6 (12.6)*	14.1	14.3	13.4
Proteins	11.4 (10.9)	10.5 (9.2)	11.6	10.0	10.6
Oil	4.1 (4.7)	1.5 (1.8)	5.0	1.5	4.0
Carbohydrates ..	67.8 (69.1)	72.2 (75.3)	66.3	73.3	69.1
Fibre	1.3 (1.6)	0.6 (0.6)	2.4	0.5	1.9
Mineral matters ..	1.0 (1.4)	0.6 (0.5)	0.6	0.4	1.0

* Figures in brackets are duplicate samples analysed at Cambridge.

Although the primary object of the experiments was to ascertain the influence of the different forms of maize on the quality of the bacon fat, records were also kept of the rates of growth of the individual pigs as ascertained by weekly weighings.

Northern Ireland Experiment.—This experiment, which commenced on January 11, 1928, was carried out under the supervision of Mr. R. G. Baskett, M.Sc.

Three lots of eight pigs of Large White Ulster type were used; Lot I at the end of the test contained six pigs, Lots II and III seven pigs each. The average initial weight of the pigs was about 105 lb. They were housed in sties and given their food in dry form. For the first six weeks the rations consisted of 50 per cent. thirds, 40 per cent. maize, and 10 per cent. extracted soya meal, and, thereafter, of 50 per cent. thirds, 45 per cent. maize and 5 per cent. soya meal. The mineral mixture was given throughout at the rate of 2 lb. per cwt. of mixed meals.

The average live-weight gains per head per day over the whole period of 106 days were as follows :—

Lot I	(Flaked whole yellow maize)	1.32 lb.
Lot II	(Flaked degermed yellow maize)	1.33 lb.
Lot III	(Raw yellow maize)	1.36 lb.

The difference in rate of growth was thus negligible. Lot II gave, however, a slightly lower average carcass percentage than Lots I and III, which were practically equal.

The pigs were disposed of to two different curers and samples of the fats were taken in accordance with the prescribed method. Determinations were made of Refractive Index, Refractometer Reading and Iodine No. (Hanus Method). The analytical results and the curers' opinions of the quality of bacon produced from each pig are as follows :—

	<i>Pig</i>	<i>R.</i>	<i>Index</i>	<i>R.R.</i>	<i>I.No.</i>	<i>Curers' opinions of bacon.</i>
Lot I (Flaked whole maize)	1 M	1.4594	50.1	57.22		Firm, but very slightly oily, lean good (G)
	3 M	1.4590	49.5	59.20		Firm, but a shade oily, lean trifle dark (G)
	5 F	1.4593	50	56.89		Firm, good white fat, lean good (G)
	14 F	1.4595	50.5	—		Quality not good, soft and oily (R)
	24 M	1.4580	48.1	52.58		Quality good, lean dark, fat firm (R)
	20 F	1.4589	49.4	56.65		Quality good, well mixed bacon (R)

Average	1.4590	49.6	56.51
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Lot II (Flaked degermed maize)	6 M	1.4584	48.6	55.04	Fat firm, but lean not quite so good (G)
	7 M	1.4584	48.6	59.77	Fat firm, good lean (G)
	8 F	1.4585	48.8	56.41	Fat firm, good lean (G)
	15 M	1.4591	49.7	59.42	Quality good, bellies thin, lean hard (R)
	19 F	1.4590	49.5	55.59	Fat firm, lean good (G)
	22 M	1.4587	49.2	54.86	Quality fair, bellies thin, lean hard (R)
	21 F	1.4580	48.1	—	Quality good, colour good, but lean hard (R)

Average	1.4586	48.9	56.85
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Lot III. (Raw maize)	4 M	1.4591	49.7	57.06	Firm, lean fairly good (G)
	2 F	1.4589	49.4	61.97	Firm, but slightly oily (G)
	12 F	1.4605	51.7	63.39	Oily, quality bad, thin bellies and thick backs (R)
	17 F	1.4585	48.8	66.04	Quality bad, very oily, thin bellies, colour good (R)
	23 M	1.4599	50.9	61.73	Oily and soft, lean good (G)
	25 F	1.4588	49.4	61.27	Quality good, backs and bellies well mixed, colour good (R)
	19 M	1.4585	48.8	57.88	Fat firm, but slightly oily, lean good (G)

Average	1.4592	49.8	61.33
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The letters "G" and "R" in last column refer to the two curers. The letters "M" and "F" in first column refer to sex of pig.

The figures show considerable individual variations within each lot, but it is quite clear that Lot III was on the whole distinctly inferior to the other two lots. Between Lots I and II the difference is not so marked, either in the Iodine Numbers or in the curers' reports, but careful examination of both suggests a slight difference in favour of the degermed maize (Lot II).

Cambridge Experiment.—This experiment, which commenced on November 28, 1927, and covered 70 days' feeding, was carried out under the control of Mr. A. N. Duckham, B.A., in the Swine Husbandry Research Department of the Animal Nutrition Research Institute.

The 24 pigs used were first-cross from Wessex Saddleback sows by Large White boar, and averaged about 88 lb. live weight per head at the start.

The feeding scheme was as follows :—

Average live weight lb.	Lot I		Lot II		Lot III	
	Flaked whole maize (yellow)	parts	Flaked degermed maize (yellow)	parts	Control (Barley)	parts
70—140	Maize	30	Maize	30	Barley	60
	Barley	30	Barley	30	Middlings	30
	Middlings	30	Middlings	30	Soya meal	10
	Ext. soya meal	10	Ext. soya meal	10	Minerals	1
	Minerals	1	Minerals	1		
140 to slaughter	Maize	40	Maize	40	Barley	80
	Barley	40	Barley	40	Middlings	15
	Middlings	15	Middlings	15	Soya meal	5
	Soya meal	5	Soya meal	5	Minerals	1
	Minerals	1	Minerals	1		

The feeding of Lots I and II was thus in accordance with the general scheme, whilst Lot III differed only in the substitution of barley for maize. The mineral mixture, of which it will be noted only 1 per cent. was added, was composed as follows :—

Ground limestone	..	..	..	1.5	parts
Steamed bone flour	..	..	..	1.25	„
Salt .. ..	..	..	..	0.25	„
Ferric oxide	..	..	..	0.25	„
Potassium iodide	..	..	..	0.004	„

The meal mixtures were fed in the form of thick slop, and drinking water was also available at all times. The pigs were weighed once weekly, except that at the start and finish and midway through the period "critical" weighings were made on three consecutive days and the average taken as the assumed weight on the middle day of the three. The general

results in live-weight increase and food consumption are summarized in the following table :—

	<i>Averages per pig</i>		
	<i>Lot I</i>	<i>Lot II</i>	<i>Lot III</i>
	<i>Flaked maize with germ</i>	<i>Flaked maize degermed</i>	<i>Barley meal</i>
	lb.	lb.	lb.
Initial live weight	88.0	86.3	88.6
Final live weight	195.7	207.8	196.7
Live weight gain in 70 days	107.7	121.5	108.1
Average gain per day	1.54	1.74	1.54
Growth index	100	113	100
Average lb. food consumed per day	6.20	6.82	6.56
Lb. food per 1 lb. live weight gain	4.03	3.93	4.25
Average No. of pigs	7	7	6

Whilst the number of pigs is rather too small to warrant a definite conclusion as to the apparent superiority of the degermed maize, it will be noted that at any rate it was certainly not inferior to the "whole" maize. The growth results obtained with the degermed maize must be regarded as very satisfactory. These pigs kept in excellent health and apparently ate rather more freely than the other lots ; nevertheless, they show the best ratio of food to live-weight gain.

For the purpose of assessing the effects of the rations upon the quality of the carcasses the pigs were divided between three curers. Two typical "Wiltshire" bacon pigs from each pen were sent to one factory for dry "Wiltshire" cure, and four others from each pen were divided between two Midland curers for "Midland" cutting and curing. There was no significant difference in carcass percentage between the lots.

On inspection, made jointly by Mr. Duckham and a member of the factory staff, note was taken of the following points : length of side, thickness of back fat, thickness of flank, colour and firmness of fat, conformation of hams, texture and smoothness of skin. There was little difference in carcass quality between the lots, but Lots I and III were rather thicker in the flank, probably because of their better finish, whilst Lot II, being heavier pigs, had a tendency for the back fat to be too thick.

The report on the "Wiltshire" sides was as follows :—

- Lot I Quality fair.
- Lot II Outstandingly good.
- Lot III Not so good as Lot I.

Arrangements were made for reports on the matured hams sent to the two Midland curers, but in one instance the

corrosive action of the curing medium obliterated the labels and made identification impossible. The curers, however, reported that there was little difference in quality between the matured hams of the consignment. In the other case, after an interim report by the curers, the final inspection and report was made by Mr. I. Fullerton, of Harper Adams College, in conjunction with the factory expert. This report is summarized below :—

Lot	Kill			
No.	No.	Texture	Colour	Smell
I	919	Firm, slightly greasy	Very pale yellow	Slightly rank
	920	Firm, slightly greasy	Nearly white	Slightly rank
II	921	Very firm	Almost white	Very slightly rank
	922	Very firm, slightly greasy	Almost white	Very slightly rank
III	923	Firm	Very pale yellow	Very slightly rank
	924	Moderately firm	Pale yellow	Slightly rank

“Taking the hams in their lots it was adjudged that those from Lot II were slightly the best.”

Considering all the available inspection data on the quality of the cured products it seemed that, although there was little difference between the various lots, the bacon and hams from the degermed flaked maize pigs (Lot II) were slightly superior to the remainder. This conclusion was substantially confirmed by the iodine values of the back fats, determined independently by Mr. R. F. Newman of Cambridge and by the factory chemist, using slightly different techniques. The results were as follows :—

	Pig No.	Sex	Iodine value		Refractometer reading	
			Newman.	Factory.	Newman.	Factory.
Lot I	5	H	61.8		50.4	
(Flaked maize	18	G	64.7		50.35	
with germ)	28	G	62.4	63.2	50.35	49.9
	10	H	59.5		50.3	
	Average		62.1		50.35	
Lot II	3	H	58.8		50.3	
(Flaked maize	22	G	60.6		50.2	
without germ)	56	G	56.1	59.0	50.2	48.9
	24	G	55.6		50.45	
	Average		57.8		50.29	
Lot III	2	G	63.1		50.5	
Control	60	G	59.5		50.15	
(Barley meal)	55	G	60.1	61.8	50.4	49.9
	26	H	59.4		50.25	
	Average		60.5		50.32	

In the Cambridge report on these experiments it is pointed out that the undoubtedly better quality of the carcasses,

hams and fat in Lot II (degermed) may have been largely due to their better rate of growth, which may possibly have been influenced by factors other than feeding. This receives some support from the Northern Ireland results, where, with little or no difference in rate of growth between the lots, the differences in quality, whether judged by inspection or by analytical criteria, were smaller than in the Cambridge experiment.

Harper Adams Experiment.—This experiment, which commenced on January 24, 1928, and continued for 19 weeks, was carried out under the supervision of Mr. I. Fullerton, N.D.A.

The procedure laid down in the general plan of the experiments was followed throughout at this centre, whilst a fifth lot was added to test the effects of ordinary uncooked white maize.

Each lot comprised six Large White pigs, averaging about 60 lb. live weight at the outset. They were housed in open-fronted sties, and received their meal food in the form of slop. A little green food was given almost daily and the pigs were allowed frequent access for short periods to small open yards.

The general results in live-weight increase and food consumption are as under :—

	<i>Averages per pig</i>				
	<i>Lot I</i>	<i>Lot II</i>	<i>Lot III</i>	<i>Lot IV</i>	<i>Lot V</i>
<i>Yellow maize flaked with germ.</i>		<i>Yellow maize flaked, degermed</i>	<i>Yellow maize, raw</i>	<i>White maize flaked, degermed</i>	<i>White maize, raw</i>
	lb.	lb.	lb.	lb.	lb.
Initial live weight ..	59.5	60.5	60.8	60.3	63.0
Final live weight ..	234.0	240.8	219.6	232.7	222.0
Live wt. gain in 133 days	174.5	180.3	158.8	172.4	159.0*
Average gain per day ..	1.31	1.36	1.19	1.30	1.34
Av. lb. feed consumed per day ..	5.07	4.98	4.46	4.93	5.31
Lb. feed per 1 lb. live- weight gain ..	3.86	3.67	3.74	3.81	3.98
Percentage of carcass to fasted live weight ..	83.3	84.3	81.9	83.2	83.2
Average No. of pigs ..	6	6	6	6	6

* 119 days.

Reference has been made earlier (p. 429) to the fact that Lot V was not strictly comparable with Lot IV, as the white maize used was not from the same consignment in these two cases; moreover, the experimental feeding of Lot V com-

menced 14 days later than that of the other four lots. This lot is only of interest, therefore, so far as the influence of the food on quality of carcass is concerned, but we have included the weight and food consumption data for the sake of completeness.

Bearing in mind the smaller initial live weights of the pigs in this experiment as compared with the other two, and the consequent longer period of feeding, the average rates of growth may be regarded as quite satisfactory. In view of the small number of pigs in each lot, however, it would be undesirable to lay any particular stress upon the differences in the average live-weight gains, which, except for Lot III (raw yellow maize), are small. The lower gain with this lot was primarily due to the difficulty in getting it to consume as much food as the other lots. That it dealt as efficiently with what it did consume is seen from the data for lb. of meals consumed per 1 lb. live-weight increase. The chief interest in these data lies in the results obtained with the degermed maize which are fully equal to those obtained where the germ was included (cf. Lots I and II). The results from the three centres are in accord on this point.

After 19 weeks' feeding (17 weeks in the case of Lot V) the four heaviest pigs from each lot were removed and divided equally between the two Midland curers who dealt with the pigs from the Cambridge experiment. The remaining pairs of pigs in each lot were fed for a further six to seven weeks and then sent to a local curer.

The reports from the various curers are summarized below :—

CURER A (Birmingham).

Report on bacon and hams from pigs killed June 8, 1928.

Bacon (June 22).

All sides inclined to softness. Except that from Lot III the bacon could be classed as of very fair quality. Colour, good in all cases.

Order of merit : Lot IV (best), Lots I and II (equal), Lot V, Lot III (worst). The fat of Lot III was reported as "definitely soft and of poor quality."

Hams (July 31).

Order of merit : Lot II (best), Lot I, Lot III, Lot V, Lot IV (worst). It will be noted that, on the bacons, the three flaked maize lots (I, II and IV) were voted best, this opinion being confirmed on the hams as regards Lots I and II, but not with Lot IV. The degermed yellow maize was first on the hams, but was judged to be only equal to Lot I on the bacons.

CURER B (Birmingham).

Report on bacon and hams from pigs killed June 6, 1928.

Bacon (June 19).

"The bacon from these pigs was rather peculiar in that many of the sides were firm to the touch but had a distinctly greasy feel and appearance. We cannot pronounce any of them to be first class, but would suggest that Lot II was best and Lot V the worst."

Hams.

The notes on the individual hams show only very small differences. "It is rather difficult to say which of these hams are the best, perhaps Lot II and Lot IV are a little superior to the remainder."

Here again the differences of quality are small, but a slight advantage is shown by the degermed maize lots.

CURER C (Local).

Bacon (July 17 and 24) (dry-cured in 14 days).

There were no appreciable differences. In all cases the lean was firm, and the fat firm and white.

Hams (dry cured 4 weeks).

All firm and of good colour, but slight differences in colour of fat.

Order of merit : Lot IV (best), Lot II, Lot V, Lot I, Lot III.

The observations of this curer are substantially in agreement with those of the other two in indicating that the whole range of difference of quality in the bacons and hams from the five lots was only small, but such difference as showed was almost invariably in favour of the degermed maize.

Samples of the back fat of each pig were taken at the time of slaughter, and were used to determine the Iodine Absorption Values in the College laboratories, by Mr. W. H. Radford, A.I.C., and Mr. T. O. Wilson, B.Sc. In the case of the pigs dealt with by Curer B composite samples for each lot were also taken by the factory chemist and used for determinations of Iodine Absorptions and Refractive Indices. The data thus obtained serve as a rough check upon the grading of the produce by inspection :—

Lot	Curer	Pig No.	Iodine value		Refractometer reading	
			College.	Factory.	Factory.	Factory.
I (Flaked yellow maize with germ)	A	43	59.0			
		55	63.8			
	B	17	60.4	62.1	50.6	
		23	59.7			
	C	52	60.9			
		53	68.8			
	Average		62.1			
II (Flaked yellow maize without germ)	A	49	57.5			
		51	61.1			
	B	21	59.4	60.3	50.2	
		26	58.7			
	C	42	61.7			
		47	58.2			
	Average		59.4			
III (Yellow maize meal raw)	A	48	69.8			
		50	67.7			
	B	15	63.5	63.2	50.1	
		22	61.2			

Lot	Curer	Pig No.	Iodine value		Refractometer reading	
			College.	Factory.	Factory.	Factory.
IV (Flaked white maize without germ)	C	54	66.6			
		56	65.2			
	Average		65.6			
	A	46	61.4			
		57	61.0			
	B	25A	64.6	62.2	50.8	
		25	60.6			
	C	44	61.9			
		45	62.4			
	Average		62.0			
V (White maize meal raw)	A	30	63.0			
		34	65.0			
	B	11	60.6	64.0	50.9	
		14	67.6			
	C	2	64.1			
		41	67.8			
	Average		64.7			

The factory tests were made on a composite sample of the fat of two pigs only from each lot, whilst the College tests were made on separate individual samples from every pig. The Refractometer Readings show practically no differences, but the Iodine Values are more significant. Bearing in mind that low Iodine Value is roughly correlated with high quality (firmness) of the fat, it is clear that both the College and factory tests confirm the opinion formed on inspection of the bacons as to the superiority of the bacon from Lot II. Taking the three "yellow maize lots," the order of superiority as determined by iodine value is II, I, III in each case. Similarly as between the two "white maize lots," IV is shown to be superior to V. Broadly summarized, the conclusions from these data are that degermed maize gives rather better quality bacon than maize with germ, and that flaked maize is rather better in this respect than raw maize.

When the individual figures are examined, however, it will be seen that there are great variations within each lot. This is equally evident in the Iodine Values found in the Cambridge and Irish experiments. Clearly, therefore, there are other factors operative besides food supply in determining the quality of bacon, and it may be that genetic factors are more fundamentally determinative of quality than fortuitous variations in the character of the food supply.

General Review of the Three Experiments.—The prime difficulty in investigating the effects of foods or food ingredients upon the quality of meat is that of devising criteria of quality that are matters of fact and capable of reasonably precise definition and measurement. Were the quality of bacon dependent simply upon variations in one or two factors—such as olein content and colour—a reasonably precise basis

of classification would not be difficult to devise, but for the more subtle qualities, such as flavour and smell, which also play so important a part in determining quality, no basis of measurement is yet possible. This complexity of the factors concerned, moreover, adds to the difficulties of grading even by simple inspection and handling, and hence it is not surprising that even in the most experienced hands complete uniformity of grading cannot be attained. If due allowance be made for these difficulties and for the personal factor that must operate where decisions have to be based upon opinion, it may fairly be claimed that the three experiments are in substantial agreement in demonstrating that the removal of the germ from maize tends towards the improvement of bacon quality. This is apparent through both the inspection reports, which sum up the whole quality complex, and the Iodine Values which give a rough criterion of the "oiliness" factor.

We started with the assumption that any improvement due to removal of the germ would be due primarily to the reduced consumption of oil thereby effected, but this is not the only change in the chemical composition of the maize that is brought about by loss of the germ. Moreover, the experiments suggest that the changes effected in the maize by cooking, as in the preparation of flaked maize, may have a separate influence upon the quality, as may also inherited characteristics of the pigs themselves. It is a matter of common experience, also, that the pig that progresses normally and satisfactorily without check is more likely to produce a carcass of good quality in every way than one which reaches the same weight only after a life of uneven progress.

The relatively small differences of quality found in our experiments suggest that the importance of the food-oil factor in determining quality may have been exaggerated, but on this point the experiments are not conclusive, since the rations contained considerable amounts of oil besides that supplied by the maize. This may be illustrated by the following data taken from the feeding of Lots I and II in the Harper Adams experiment, the figures for oil being based upon the composition of the maize used as shown on p. 430, and average figures for barley, sharps and soya meal.

<i>Consumption of oil, average per pig</i>		
	<i>Lot I</i>	<i>Lot II</i>
	<i>(Maize, with germ)</i>	<i>(Maize, without germ)</i>
	lb.	lb.
Total oil consumed	20.21	14.61
Including maize oil	8.51	3.03

It will be seen that although Lot II received about 5½ lb. less maize oil per pig than Lot I, it received, nevertheless, about 11½ lb. of other oils in the form of barley, wheat and soya oils. It is possible, therefore, that if a less oily basal ration had been used the effect of degerming the maize on the quality of the bacon might have been more marked.

These considerations, however, do not affect the general lesson to be derived from the experiments, that degermed maize gives a better quality of bacon than ordinary maize meal containing the germ, without any impairment of the nutritive value of the maize as shown in the rate of growth of the pigs.

* * * * *

MARKETING NOTES

National Mark Beef.—The weekly average numbers of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during April, May and June, 1931 and 1932, and the three weeks ended July 23, 1932, were as follows:—

LONDON AREA

<i>Period</i>	<i>London</i>	<i>Birkenhead</i>	<i>Scotland*</i>	<i>Total London supplies</i>
April, 1931	2,077	74	2,553	4,704
April, 1932	1,835	195	1,293	3,323
May, 1931	1,809	20	2,053	3,882
May, 1932	1,607	99	1,113	2,819
June, 1931	1,968	23	1,111	3,102
June, 1932	1,232	252	990	2,476
Two weeks ended July 16, 1932	1,021	241	906	2,171

* Figures include Scotch sides graded and marked in London.

BIRMINGHAM AND YORKSHIRE AREAS

<i>Period</i>	<i>Birmingham</i>	<i>Leeds</i>	<i>Bradford</i>	<i>Halifax</i>
April, 1931	428	638	420	89
April, 1932	851	409	390	82
May, 1931	403	593	378	68
May, 1932	901	409	393	76
June, 1931	509	683	424	70
June, 1932	815	356	300	60
Two weeks ended July 16, 1932	825	339	294	70

The number of home-killed sides graded and marked for the London area during the past three months shows a decrease as compared with the corresponding period of last year, but, as there has also been a decline in the number of cattle slaughtered at the Islington Abattoir, the percentage of sides graded and marked shows no significant change in the two years. The position at Islington is doubtless due in the

main to the severe competition from imported meats, but it is also attributable to grass-fed cattle being about three weeks late this year. During the month many retailers have expressed dissatisfaction at Smithfield regarding difficulties in obtaining National Mark Beef, especially of "Select" grade. The shortage has been accentuated by the smaller number of Scotch sides now marked as compared with 1931, and by the considerable supply of Canadian beef that is left unmarked by the trade because it cannot be marked with the home-killed National Mark. The shortage of English "Select" sides was reflected during June by a slight rise in price, which, however, was not more than is normal for this season. Hot weather at the end of the period retarded the home-killed beef trade.

The figures for Birmingham are indicative of the improved position in this area. Grading and marking of beef on the wholesalers' stalls in the City Meat Market was resumed on May 2, after an interval of nearly two years, and in consequence there has been a considerable increase in the number of sides graded and marked. It is interesting to note that the percentage of sides marked to the total received on the market has steadily increased since January, from 25.5 to 55 per cent. The period under review is always associated with declining beef supplies and these figures can, therefore, be regarded with satisfaction. The Leeds returns show a decrease, which is partly due to seasonal causes, but there is no marked diminution in the percentage of sides graded. In Bradford and Halifax the numbers of sides graded have been well maintained. A certain number of Canadian sides has been graded and marked with the "Canada" mark in the Yorkshire area.

National Mark Fruit.—*New Editions of Marketing Leaflets.*—New editions of the illustrated marketing leaflets on the National Mark schemes for strawberries, cherries, tomatoes and cucumbers, and a leaflet on the new plum scheme, have been issued recently. Among the modifications of the requirements of these schemes contained in the leaflets, the two following are of special interest. Authority to apply the National Mark may now be granted to associations of growers, the individual members of which need not be in a position to comply with the conditions of the schemes as to minimum output or acreage that were formerly imposed on all applicants. Further, as an alternative to applying the National Mark by means of the official labels issued by or on behalf of the Ministry, authorized growers may be licensed to incorporate

the National Mark in the design of their private labels or basket covers.

Copies of the leaflets may be obtained free of charge on application to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, S.W.1.

Roll of Packers.—The following have been added to the lists of authorized packers of National Mark fruit :—

PLUMS.

- Cambs. :* Ayers & Son, Elm, Wisbech.
 Cambridgeshire C.C. Experimental Station, Rampton.
 J. A. G. Hiscock, North Brink Farm, Wisbech.
 H. C. Selby, Walpole Highway, Wisbech.
 A. Shuker, North Bank, Wisbech.
 F. J. Smith, 8 & 9 North Bank, Wisbech.
 C. J. Tribe, Prior Fruit Farm, Leverington Common, Wisbech.
- Glos. :* W. H. Allen, "Redcott," Swindon Village, near Cheltenham.
 Mrs. L. W. Coldicott, Campden, Glos.
 S. F. Cooke, South Bank, Cheltenham.
 A. H. Daft, 2 Holly Villas, Granley Road, Cheltenham.
 M. G. Ling, Kents Green House, Taynton, near Gloucester.
 W. F. Morris, Bredon Fruit Farm, Kinsham, near Tewkesbury.
 Overbury Orchards, Kemerton, Tewkesbury.
 G. Rees, Moors Gardens, Tewkesbury Road, Cheltenham.
 A. T. Smith, Stanwick Gardens, Swindon Road, Cheltenham.
 A. W. Smith, The Moors, Tewkesbury Road, Cheltenham.
 H. W. Smith, Rowanfield, Cheltenham.
 S. J. Smith, Kingsditch, Cheltenham.
 Stubb Bros., Norton House, Alston, Cheltenham.
 J. Yeend, The Homestead, Hagden Road, Cheltenham.
- Hereford :* F. Boddington, Manor Farm, Burghill.
- Kent :* East Malling Research Station, East Malling.
 S. W. Mount, Hode Farm, Patricxbourne, near Canterbury.
- Sussex :* L. Baker, Hill's Green, Kirdford.
 R. K. Holdsworth, Belchambars Farm, Kirdford.
 J. R. H. Napier, Kirdford, Billingshurst.
- Worcs. :* H. Bakewell, Old Hill Farm, Grimley, Worcs.
 E. W. Beck, "Hill Crest," Evesham.
 R. H. Bell, Tilton Hill, Stourpoint.
 D. Blore, Fladbury.
 F. Boswell, Hill Crest, Pershore.
 H. S. Boswell, The Towers Fruit Farm, Pershore.
 H. Blyth, Pershore.
 R. L. Brazier, Harvington, near Evesham.
 H. W. Clark, Rough Hill Fruit Farm, Birlingham, Pershore.
 B. C. Clive, Eckington Bank, Pershore.
 J. T. Coates, Pinvin, Pershore.
 L. Coates, Pinvin, Pershore.

T. & M. Dixon, Tardebigge, Bromsgrove.
 D. W. Fitzgerald, Brook Farm, Cropthorne, Pershore.
 R. George & Sons, Swan Lane, Evesham.
 Hampton Fruit Farm, Hampton, Evesham.
 C. J. Harriss, Belgrave Fruit Gardens, Pinvin, Pershore.
 H. T. Horsfield, Knowle Hill, Evesham.
 T. H. Horsfield, South Littleton, Evesham.
 E. Knight, Pershore.
 Littleton & Badsey Growers, Ltd., Badsey, Evesham.
 H. Masters & Son, Evesham.
 C. C. Moberly, Tayford House, Evesham.
 C. A. Mumford, Three Springs, Pershore.
 F. P. & C. P. Norbury, Sherridge, near Malvern.
 H. T. & J. Nott, Kyrewood, Tenbury.
 W. Oakes & Son, Seaford Grange, Pershore.
 A. N. Sargint, Summer House, Evesham.
 W. M. Sherratt, Jesamine, Hallow.
 R. R. Smith, South Littleton, near Evesham.
 S. W. Smith, The Nook, Hampton, Evesham.
 Capt. R. H. Stallard, Throck Morton, Pershore.
 J. M. Stokes, Evesham.
 Capt. C. H. Sykes, Bricklehampton, Pershore.
 C. Vint, Drakes Broughton, Pershore.
 Messrs. Westcott Bros., The Ford, Pershore.
 R. White & Sons, Vine Street, Evesham.
 E. S. Whiteley, Garthlands Fruit Farm, Pershore.

APPLES

Essex : W. R. Griffiths & Son, Mayland Farm, Mayland, Chelmsford.
Glos. : C. Hicks, Lanes Farm, Hatfield Peverel.
 H. J. Carter, Allenfield, Leckhampton.
 Forest and Orchard Nurseries, Ltd., Milbury Heath, Falfield.
 D. P. Morgan, Hill House, Bushley, Tewkesbury.
 H. J. Phelps, Tiberton.
Hants. : A. E. Roberts, Frith Farm, Wickham.
Herts. : Herts Institute of Agriculture, Oaklands, St. Albans.
Kent : Rev. F. Chambers, Lested Lodge, Chart Sutton, Maidstone.
 Ditton Laboratory, East Malling.
 L. J. Goodhew, 8 East Street, Sittingbourne.
 E. F. Guthrie, Mascall's Pound, Paddock Wood.
 S. H. Kemsley, Haymans Hill, Horsmonden.
 Lt.-Col. C. Murdoch, Wester Hill, Linton.
Somerset : O. Brice, The Brewers, Taunton.
 A. H. Lees and R. T. Ridge, the Manor Farm, Brockley, West Town, Bristol.
Sussex : R. Quas, Chithurst Fruit Farm, Rogate, Petersfield.

PEARS

Essex : H. J. Russel, Lower Farm, Hatfield Peverel.
Glos. : The Forest and Orchard Nurseries, Ltd., Milbury Heath, Falfield.

Plums.—As will be observed from the foregoing list, a large number of growers have already been authorized in the National Mark Plum Scheme, which is now commencing its first season of operation.

Strawberries and Cherries.—The grading of National Mark strawberries and cherries inspected on the markets recently has been very consistent, and very favourable reports upon the quality of the fruit have been received. In Covent Garden Market, London, especially, considerable difficulty was experienced in many instances in obtaining National Mark supplies as these were usually sold in advance or almost immediately on arrival at the market.

National Mark Cider.—The entries in the cider classes at the Three Counties Show, held at Gloucester from June 7-9, showed a marked increase over last year, and of the nine awards six (including one first and three seconds) were secured by National Mark packers.

The following additional applicants have been authorized under the Scheme :—

Mrs. M. J. Huggins, Thorverton, Devon.

H. W. Davis, Sutton Montis, Somerset.

R. J. J. Denning, Ilminster, Somerset.

T. Gray, Junr., Tedburn St. Mary, Devon.

A. J. Abbott, Ivybridge, Devon.

W. Mortimore, Broad Clyst, Devon.

The total number of authorized packers is now 83, consisting of 58 manufacturers and farm cider-makers, 2 associations of farm cider-makers, and 23 bottlers.

National Mark Honey.—In addition to the particulars contained in the May number of this JOURNAL, further details of this scheme are given below.

Grade Designations and Definitions of Quality.—After consultation with the various interests concerned, grade designations and definitions of quality, as set out on pages 446, 447, have been agreed upon for honey produced by bees from nectar in England and Wales. These designations and definitions have been given statutory effect in the Agricultural Produce (Grading and Marking) (Honey) Regulations, 1932.

PROCEDURE AND CONDITIONS TO BE OBSERVED BY PACKERS
AUTHORIZED TO APPLY THE NATIONAL MARK

(a) *Output.*—Authority to apply the National Mark may be granted to individual commercial beekeepers, packing stations and dealer packers who normally pack not less than two tons of honey per annum.

No stated quantity of honey is required to be packed annually by members, either individually or collectively, of an association using the National Mark. Provision is made for the control service to be adopted by Associations.

(b) *Grading : Observance of Grade Designations.*—Authorized packers may apply the National Mark only to containers of honey that comply

with the definitions of quality prescribed for the grade designations (see pages 446, 447).

(c) *Premises and Equipment*.—All premises and equipment used in connexion with the packing of National Mark honey shall be clean and suitable for the purpose.

(d) *Packing*.—The containers used for National Mark honey shall be clean, hygienic and of a type or types approved by the Ministry for the purpose.

(e) *Use of National Mark Labels*.—The National Mark may be applied either (1) by means of serially numbered official labels bearing the National Mark and the grade designation, which will be issued on payment to authorized packers by or on behalf of the Ministry, or (2) by means of private brand labels in which the National Mark design and the grade designation have been incorporated under a licence issued by the Ministry. Official labels are not transferable and care must be taken by packers to prevent them getting into the hands of unauthorized persons. Labels of a kind approved by the Ministry shall be used for each type of container employed. The quality and colour of the contents of each package to which a label is applied must conform to the statutory definitions set out on pages 446, 447, according to the grade designation and colour requirement appearing on the label.

National Mark labels may be applied in addition to the authorized packer's own label.

Unless permission to the contrary is granted by the Ministry, the National Mark may be applied only to the following containers, viz., glass jars for 2 lb., 1 lb., $\frac{1}{2}$ lb. and $\frac{1}{4}$ lb., standard cartons for sections, approved section wrappers, and tins and opaque containers for 4 lb., 7 lb., 14 lb., 28 lb., and 56 lb.

The National Mark shall be applied only by the authorized packer who has packed the honey, and only at his authorized premises.

(f) *Imported honey*.—Before an authorized packer may trade in imported honey he must obtain a licence from the Ministry.

(g) *Records*.—An authorized packer shall keep, to the satisfaction of the Ministry, a monthly record showing the amount of honey packed by him under the National Mark and the sources of supply. Where such honey is not obtained directly from the producer, the authorized packer shall obtain from the seller an express guarantee that the honey was produced by bees from nectar in England and Wales, together with an undertaking to submit, if required, proof of origin.

(h) *Federation of Associations of Packers of National Mark Honey*.—If so required by the Ministry, an authorized Association shall join any federation of Associations of National Mark honey packers which, with the Ministry's approval, may be established by such packers for the purpose of improving the trade in National Mark honey.

(i) *Inspection and Sampling*.—An authorized packer shall allow his authorized premises and all equipment, stocks of honey, and records to be inspected at any reasonable time by any duly authorized officer of his association or of the Ministry of Agriculture and Fisheries, and, if so required, shall allow any such officer to inspect at any reasonable time and place, and to draw samples from, honey packed or intended to be packed as National Mark honey, and to be present when the honey is being packed.

NOTE.—Copies of a leaflet (Marketing Leaflet No. 31) giving full details of the National Mark Honey Scheme may be obtained, post free, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

(A) EXTRACTED HONEY (CLEAR OR GRANULATED) PRODUCED IN ENGLAND AND WALES—GRADE DESIGNATION AND DEFINITIONS.

Designation.	General Requirements.		Special Requirements.	
	Purity. 2.	Flavour. 3.	Cleanliness. 4.	Colour. 5.
1. Select	The honey shall be produced by bees from nectar and when liquid and clear shall have a specific gravity of not less than 1.415 at 60°F. Honey shall not contain less than 80 per cent. of total solids and not more than 2.5 per cent. of sucrose. The honey shall be free from added substances.	The honey shall be of a characteristic flavour well-ripened and free from any objectionable aromas and/or flavours (e.g., due to overheating, fermentation, smoke, carbolic acid, and natural taints such as honey dew, wild onion, garlic, or privet). Total acidity shall not exceed 0.2 per cent. expressed in terms of formic acid.	The honey shall be strained through a single thickness of a cloth or strainer equivalent to a single thickness of a standard bolting cloth of 54 meshes per linear inch. All honey shall be free from surface dirt and scum.	The honey shall be uniform in colour and shall be described as "Select Light Colour," "Select Medium Colour" or "Select Dark Colour," according to the Ministry's standard colour glasses for clear honey.

(B) SECTION HONEY PRODUCED IN ENGLAND AND WALES—GRADE DESIGNATION AND DEFINITIONS.

Designation.	General Requirements.		Special Requirements.				
	Purity.	Flavour.	Weight.	Cleanliness.		Condition.	
				Wood-work.	Cappings.	Comb.	Cell contents
1.	2.	3.	4.	5.	6.	7.	8.
Select (Section)	The honey shall be produced by bees from nectar. The honey shall not contain less than 80 per cent. of total solids and not more than 2.5 per cent. of sucrose. The honey shall be free from added substances.	The honey shall be of a characteristic flavour well-ripened and free from any objectionable aromas and/or flavours (e.g., due to fermentation, smoke, carbolic acid, and natural taints such as honey dew, wild onion, garlic, or privet). Total acidity shall not exceed 0.2 per cent. expressed in terms of formic acid.	The weight of each section (wood comb and honey) shall be not less than 15 oz.	The wood shall be white, new and undamaged. The outside surfaces shall be scraped free from propolis.	The cappings shall be free from propolis or pronounced "travel" stain.	The comb shall be well sealed, and shall not project beyond the wood-work of the section. The surface of the comb shall be dry (free from any sign of "weeping") and free from damage caused by bruising or other means.	The cell contents shall consist of honey which shall be ungranulated.

Roll of Packers.—The following have been authorized by the National Mark Committee to apply the National Mark to graded honey produced in England and Wales :—

INDIVIDUAL COMMERCIAL BEEKEEPERS.

- Devon :* Buckfast Abbey Apiary, Buckfast, Buckfastleigh, Devon.
Dorset : J. T. Davies, Wyke, Gillingham, Dorset.
Gloucester : J. E. Swaffield, 1 Libertus Villas, Cheltenham, Glos.
Hants : John Mavie & Co., Broad Street, Alresford, Hants.
Herts : E. H. Taylor, Ltd., Beehive Works, Welwyn, Herts.
Middlesex : Capt. H. L. Bluck, Newlands Bee Farm, Pinner, Middx.
Norfolk : E. W. D. Madoc, Tottington, Thetford, Norfolk.
 C. Reynard, Diss, Norfolk.
 J. C. Stebbings, Hilborough, Norfolk.
Suffolk : H. C. Aubin, Bradfield St. George, Bury St. Edmunds, Suffolk.
Warwick : N. F. Morgan, Bickenhill, Birmingham.
Wilts : J. H. Gaisford, Manor House Farm, Tockenham, Wootton Bassett, Wilts.
 A. Underwood & Son, 15 Monday Market Street, Devizes, Wilts.

The following Associations have been approved, and certificates of authorization will be issued when the names of the registered agents approved by the Association have been received.

ASSOCIATIONS OF BEEKEEPERS.

- Cornwall Beekeepers' Association.*—The Secretary, Homeward, Darite, Liskeard.
Devon Beekeepers' Association.—The Secretary, 2 Omega Villas, Alphington Road, Exeter.
Gloucester Beekeepers' Association.—The Secretary, 1 Libertus Villas, Cheltenham.
Norfolk Beekeepers' Association.—The Secretary, School House, Terrington St. Clement, near King's Lynn.
Northampton Beekeepers' Association. The Secretary, "Ramsden," Meadway, Weston Favell, Northants.
Somerset Beekeepers' Association.—The Secretary, Somerset Beekeepers' Association, Ilminster, Somerset.

Publicity for National Mark Produce.—National Mark Shopping Weeks were held at Leeds and Preston in association with the Ministry's marketing demonstrations at the Great Yorkshire Agricultural Show (July 12-14) and the Royal Lancashire Agricultural Show (July 28-Aug. 1), respectively. An important feature of such Shopping Weeks is the Shop Window Display Competition open to retailers who stock National Mark products. That arranged at Leeds was the most successful that has yet been held, and attracted no fewer

than 363 entries. There is no better way of introducing goods to the public than by means of attractive shop window displays, and the success attending the competitions at Leeds and in other towns is very gratifying, not only from this point of view, but as an indication of the growing support of the National Mark movement by the distributive trades.

Press advertising in July included advertisements of National Mark beef in the Birmingham, Leeds and Bradford newspapers, National Mark honey and National Mark fruit in trade papers, and special advertisements relating to the National Mark Plum scheme in certain papers circulating in the Evesham and Wisbech districts and in Kent.

Under the joint auspices of the Institute of Certificated Grocers and the Ministry, fifteen of the successful students in the Institute's examination, accompanied by three teachers, made a tour of selected agricultural centres, including several National Mark factories and packing stations, in the first week of July. A visit to the Ministry's marketing demonstration at the Royal Agricultural Show was the concluding item of the itinerary.

A new leaflet (Marketing Leaflet No. 32A) has been issued explaining for the information of wholesale and retail fruit distributors the principal features of the National Mark Plum scheme. Copies of the leaflet may be obtained, free of charge, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

Displays of Home Produce.—Following similar ventures in other large cities, the Empire Marketing Board have taken a temporary lease of shop premises at 10-12 High Street, Sheffield, which are being occupied for fortnightly periods by the various countries of the Empire in turn. The period July 11-23 was allotted to England and Wales. A representative range of home-produced foodstuffs, including National Mark products in season, was displayed in the shop, and samples of most of the commodities were on sale. As on previous occasions the display was organized by the Ministry in conjunction with the National Farmers' Union, the Food Manufacturers' Federation, the National Food Canning Council and other organizations.

A display of National Mark produce was arranged by the Ministry at a Produce Exhibition held by the West Sussex Federation of Women's Institutes at Parham Park, near Pulborough, Sussex, on July 22.

Marketing Demonstrations.—The Ministry's marketing demonstrations were staged at five agricultural shows during

July, including that of the Royal Agricultural Society of England at Southampton, July 5-9. The Ministry's stand was visited by Their Royal Highnesses the Duke and Duchess of York at the Great Yorkshire Show, Leeds, on July 13.

The Denbighshire and Flintshire Show will be visited on August 10, when demonstrations will be staged relating to the National Mark, Butter Marketing and the Organization of Wool Marketing.

The Wheat Act.—*By-laws of the Wheat Commission.*—The Wheat Commission have now made the Wheat By-laws, 1932, which have been approved by the Minister of Agriculture and Fisheries and the Secretaries of State concerned with agriculture in Scotland and Northern Ireland. The Wheat (Quota Payments and Registration) By-laws, 1932, made on June 15 last have been revoked, as they have been incorporated in the consolidated By-laws recently approved.

The nature of the provisions of the first set of By-laws were explained in our last issue. The present By-laws contain provisions relating to the following additional matters:—

- (i) Claims for, and making of, deficiency payments and payments in advance on account of deficiency payments;
- (ii) The issue of wheat certificates;
- (iii) Conditions governing the removal of wheat from farms before sale;
- (iv) Records to be kept, and returns to be furnished, by registered growers.
- (v) The procedure to be followed when the Flour Millers' Corporation is ordered by the Minister to buy unsold stocks of wheat; and
- (vi) Various provisions relating to authorized merchants and local wheat committees.

The Third Schedule to the By-laws contains particulars of the areas for which local wheat committees are to be appointed.

The Definition of Millable Wheat.—Under the Wheat (Definition of Millable Wheat) Regulations, 1932,* made on July 20 last by the Minister of Agriculture and Fisheries and the Secretaries of State concerned with agriculture in Scotland and Northern Ireland, millable wheat for the purposes of the Wheat Act, 1932, is defined as follows:—

“Millable wheat shall be wheat which is sweet and in fair merchantable condition, commercially clean as regards

* Copies of the Regulations may be obtained from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, London, W.C.2; 120 George Street, Edinburgh; 15 Donegall Square West, Belfast; or through any bookseller, price 1d.

admixture and tailings, and commercially free from heated or mouldy grains or objectionable taint, and capable of being manufactured into a sound and sweet flour fit for human consumption having regard to the customary methods employed in the milling industry for cleaning and conditioning wheat."

Deficiency payments under the Act can only be made to registered growers in respect of wheat which conforms to this standard.

Address of Wheat Commission.—The Wheat Commission have now taken up permanent quarters at Westminster House, Smith Square, Westminster, S.W.1 (Tel.: Victoria 8815).

Hops Marketing Scheme.—After consideration of a report by Mr. E. M. Konstam, C.B.E., K.C., who held the Public Inquiry into objections lodged against the scheme, the Minister notified the promoters of the modifications he proposed to make. (The principal modification related to the elimination of the provisions for the allocation of selling quotas based upon the 1931 production of registered producers.) These modifications were accepted by the requisite majority of the promoters and the revised scheme was then laid before Parliament as required by the Act. Affirmative resolutions were passed by both Houses, and an Order approving the scheme, in the terms of the draft laid before Parliament, was made by the Minister on July 7.

The scheme is now in a "suspensory period," during which a poll of producers has to be taken to decide whether the scheme shall remain in force. Unless a two-thirds majority of the producers voting, both as regards the number of voters and their aggregate acreage under hops, is secured in favour of the continuance of the scheme, it will lapse; and if, before the end of the suspensory period, it is proved to the satisfaction of the Minister that the number of producers who voted is less than one-half the total number of producers, the scheme will be revoked. The only provisions of the scheme which are in operation during the suspensory period are those incidental to the conduct of the poll.

A list of the persons who are believed to be producing English hops has been compiled by the Ministry, and forwarded to the Hops Marketing Board, who have taken steps to supply every producer named in this list, and every other person who, the Board have reason to believe, is a producer, with a

form of application for registration under the scheme. Every producer (other than exempted producers) who registers with the Board will be able to vote on the question whether or not the scheme shall remain in force ; but voting papers must reach the offices of the Board (45 Borough, London, S.E.1) on or before August 5, otherwise they will be invalid.

If the poll is in favour of the continuance of the scheme, the full operation of its provisions (including the marketing provisions) will come into force one month after the result of the poll is declared.

Until the end of May, 1933, the scheme will be administered by a Board of eighteen members including, as nominees of the Minister, Sir Bernard Greenwell, Bart., a former member of the Board of Directors of English Hop Growers, Ltd., and Major Cecil Higgins, M.C. After that date this Board will be succeeded by a board elected by the producers in accordance with the scheme.

Copies of the scheme may be obtained from the Secretary, Hops Marketing Board, 45 Borough, London, S.E.1.

Agricultural Marketing Act, 1931.—The Act provides for the establishment of Agricultural Marketing Funds from which the Minister, on the recommendation of an Agricultural Marketing Facilities Committee, may make loans to boards administering schemes under the Act.

The Minister of Agriculture and Fisheries and the Secretary of State for Scotland have made Regulations, The Agricultural Marketing (Facilities Committee) Regulations, 1932 (S.R. & O. 1932, No. 560), governing the constitution and procedure of Agricultural Marketing Facilities Committees, and the Minister of Agriculture and Fisheries, with the approval of the Treasury, has made The Agricultural Marketing (Loans) (England) Regulations, 1932 (S.R. & O. 1932, No. 527), prescribing the terms on which loans may be made in the case of English marketing schemes.

The Minister is also required by the Act to appoint two committees (a consumers' committee and a committee of investigation).

The Consumers' Committee is charged with the duty of considering and reporting to the Minister on the effect of any scheme on consumers of the regulated product, and any complaints made to the committee as to the effect of any such scheme on consumers of the product.

The Committee of Investigation is charged with the duty of considering and reporting on matters referred to it by the Minister, including (a) reports of the consumers' committee, and (b) complaints made to the Minister as to the operation of any scheme that cannot appropriately be referred to the consumers' committee.

The Minister of Agriculture and Fisheries and the Secretary of State for Scotland have prepared draft Regulations, The Agricultural Marketing (Consumers' Committee) Regulations, 1932, and the Agricultural Marketing (Committee of Investigation) Regulations, 1932, governing the constitution and procedure of these committees.

Agricultural Marketing Act, 1931.—Fat Stock Scheme (Scotland) Order.—The Secretary of State for Scotland has made an order under Section 19 (7) of the Act, vesting in the governing body of the Scottish Agricultural Organization Society, Ltd., the powers and duties conferred by the Act upon an Agricultural Marketing Reorganization Commission, for the purposes of preparing a scheme (or schemes) to be applicable to Scotland, or any areas of it, for regulating the marketing of fat stock ; of investigating the extent to which the working of the scheme can be facilitated by co-operation between the Board administering it and other persons concerned in the marketing of fat stock, and of making recommendations for promoting such co-operation.

"Fat Stock" in this Order means cattle or sheep ready for slaughter, but does not include pigs.

The expenses incurred by the Committee are to be met out of the annual grant made to the Scottish Agricultural Organization Society, Ltd., from moneys provided on the vote of the Department of Agriculture for Scotland, while its procedure will be governed by the provisions of the Agricultural Marketing (Reorganization Commission) (Great Britain) Regulations, 1932.

Irish Free State : Agricultural Produce (Potatoes) Regulations, 1931.—A summary of the Agricultural Produce (Potatoes) Act, 1931, which makes provision for the regulation of the export of potatoes from the Irish Free State, was published on p. 834 of the November, 1931, issue of this JOURNAL.

The Regulations made under the Act prescribe as follows regarding (1) grading, (2) conditions, and (3) method and manner of packing seed and ware potatoes.

- (1) *Grading*.—All seed potatoes must be passed over a suitable apparatus of specified type consisting of two riddles not more than 2 in. or less than $1\frac{1}{4}$ in. in gauge respectively, except (a) certain named varieties, and (b) where the purchaser requires seed potatoes of a diameter outside the limits stated above; in these cases, potatoes may be graded by hand.

Ware potatoes must be passed over a single riddle having a gauge of 2 in.

- (2) *Conditions*.—Special requirements as to the condition or state of potatoes at the time of packing are laid down so as to ensure that both seed and ware potatoes shall be in good condition and reasonably free from soil or other extraneous matter.
- (3) *Method and Manner of Packing*.—Except in specially approved instances, potatoes must be packed in sacks each containing 1 cwt. of potatoes exclusive of the weight of the sack and any soil or other extraneous matter that may be contained therein. Sacks must be clean, sound and sufficiently strong, and the mouth of each must be securely sewn.

The conveyance of the potatoes by road, rail and ship or canal boat is also governed by regulations designed to protect the potatoes during transit from damage arising from any cause.

Instructions as to application for registration of premises and for exporters' licences, etc., and the scales of fees chargeable for various services are also laid down.

Every package for export must be marked with the approved name prescribed for the county or district in which the potatoes were grown, the name of the variety of potatoes, the distinctive mark (if any) assigned to the packer's premises, the trade initials of the exporter, and, in the case of seed potatoes, the words "Certified Seed," or, in the case of ware potatoes that are the produce of crops certified to be 99.5 per cent. pure and grown on bright soil, the words "Special grade, bright soil." The marks must be applied by printing, branding, stencilling or labelling.

The official seals required to be placed on each package of potatoes for export are circular metal discs $\frac{7}{10}$ in. in diameter, bearing on one side the words "Department of Agriculture, Dublin," and on the reverse "Certified Seed" or "Inspected Ware." Seed potato seals are coloured red, and ware potato seals, green.

France : Standards for Fruit and Vegetables.—The export of fruit and early vegetables from France is being reorganized by the adoption of standards for fourteen kinds of fruit (including cherries, plums, pears, apples, grapes, blackcurrants, gooseberries and strawberries) and three kinds of vegetables.

On the authority of the Ministries of Commerce and Agriculture, a scheme has been devised by the National Committee for the exportation of fruit and early vegetables, on which 63 *Departments* are at present represented, while steps are being taken to secure the representation of others.

The scheme provides for the inspection of the produce by experts before dispatch, at centres in the areas of production, and for the use of a stamp or mark on all packages to guarantee that the contents conform to the standards established. The Committee is also exploring the possibility of the adoption of a cold-storage van of a type that would be specially suitable for the fruit and early vegetables traffic.

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LIVE STOCK IMPROVEMENT SCHEME REPORT FOR THE YEAR ENDED MARCH 31, 1932

THE steady development that has taken place year by year in the Live Stock Improvement Scheme has been checked by the urgent need that arose last summer for the reduction of national expenditure. The various sections of the Scheme have, however, been continued, though reductions have been made either in the rates of grant or in the number of grants, or in both directions in one section.

The number of grants provided for bulls was reduced from 1,600 to 1,500, while the annual grants to Bull Societies, which have been at the rate of one-third of the purchase price of the bull for the first five years of a Society's existence and one-fourth thereafter, will now all be at the one-fourth rate. Similarly the number of grants in respect of boars was reduced from 1,100 to 1,000. The maximum Direct Grants per stallion payable to Heavy Horse Societies have been reduced from £60 to £40, and the grants for Assisted Nominations from £40 to £30, and provision cannot be made for any increase in the number of subsidized Societies. The maximum Direct Grant was increased from £40 to £60 per stallion in 1930, but the maximum grant for Assisted Nominations had been £40 per stallion from the commencement of the Scheme. Members of Milk Recording Societies have been finding it very difficult to meet the cost of recording their herds, and consequently a relatively smaller saving has been made in this section of the Scheme. The grants to these Societies have been at the rate of £3 10s. per herd for the first two

years of a cow-owner's membership and £3 thereafter, but the rate will now be £3 per herd in all cases.

The Live Stock Improvement Scheme has not only the direct and practical value of grading up the live stock of farmers who make use of the premium sires or join Milk Recording Societies, but it has, also, the indirect and educational value of demonstrating to farmers generally the advantages to be obtained from the use of good pedigree sires and the benefit to be derived from recording the milk yields of their cows. The Ministry is glad, therefore, that it has been possible to continue all sections of the Live Stock Scheme, and it is hoped that the reductions made will not seriously impair the general usefulness of the Scheme in assisting and encouraging the grading up of ordinary farm stock.

The continued depression in the farming industry has made it more difficult for farmers, who provide bulls and boars for use under the Scheme, to find the money necessary to purchase as high-class animals as they did in the past. The general standard of the premium sires has, however, on the whole been fairly well maintained, and this affords evidence, in view of the present need for careful expenditure, that the value of using the best possible sires is realized by farmers who are providing the premium animals.

In last year's Report a summary was given of the provisions of the Improvement of Live Stock (Licensing of Bulls) Act, which was passed last year. The Act provides for an interval of at least three years before it may be brought into force as regards licensing in England and Wales, so that the earliest date at which bull licensing may be commenced is August 1, 1934. The provision included in the Act under which bulls which have been rejected for licensing in Ireland may not be moved alive out of the wharves at which they are landed in this country took effect as from the passing of the Act on July 31, 1931. As a result only 127 rejected bulls, all of which were slaughtered at the ports, were landed in Great Britain in the eight months August, 1931, to March, 1932, as compared with 865 rejected bulls landed in the nine months ended March, 1931, of which only 122 were slaughtered on arrival, while 743 left the ports for farms and markets.

Details relating to the different sections of the Live Stock Improvement Scheme are given in the remainder of this Report, but it may be mentioned here that the average numbers of services of premium bulls, boars and heavy stallions showed an increase in 1931-32 over the previous

year, and the average yield of milk per cow recorded—719 gallons—was the highest on record.

Bulls.—The number of premium bulls in service at the end of March, 1932, was 1,494, a decrease of 43 as compared with a year earlier. This decrease was due solely to the necessity of making a reduction in expenditure.

NUMBER OF BULLS SUBSIDIZED EACH YEAR SINCE THE COMMENCEMENT OF THE SCHEME

<i>Year</i> (April 1–Mar. 31)	<i>No. of</i> <i>bulls</i>	<i>Year</i> (April 1–Mar. 31)	<i>No. of</i> <i>bulls</i>
1914-15	497	1923-24	978
1915-16	633	1924-25	1,069
1916-17	659	1925-26	1,175
1917-18	710	1926-27	1,287
1918-19	721	1927-28	1,372
1919-20	675	1928-29	1,408
1920-21	668	1929-30	1,476
1921-22	847	1930-31	1,537
1922-23	947	1931-32	1,494

The average number of services per bull in 1931-32 was 66, as compared with 65 in 1930-31. Much more use is made of the premium bulls in some parts of the country than in others. In Cornwall the average was 84 cows served per bull, in Devon 83 cows, and in Wales 74 cows.

Reports have been received from several districts that an appreciable number of farmers have reverted to calf-rearing as a result of the lower prices for milk. These, and other farmers who breed and rear calves, should use good bulls, as by doing so they will not only secure better prices for their calves, but will assist in the general up-grading of stock. An auctioneer in the Midlands, who holds sales of stock sired by premium bulls, is satisfied by his experience that these bulls are doing much good in raising the standard of farm stock and in giving an incentive to farmers to take a pride in their cattle, while the Nottinghamshire Live Stock Sub-Committee has reported that they are much impressed by the marked improvement that has resulted in the general standard of stock in districts in which Bull Societies are established. Dealers and farmers are prepared to pay higher prices for calves and young stock known to be sired by good bulls, as their experience has shown that such stock proves more economic to rear and feed.

Reference was made in last year's Report to the steps that were then being taken to form an Association of Bull Societies in Brecon, Radnor and Monmouth, with the object of ear-marking the progeny of the premium bulls located in these counties and subsequently of disposing of the earmarked

stock. The Association has now been launched, and the earmarking of calves is being taken up with enthusiasm, while increased interest has been aroused among the members of the Societies concerned, and additional members have been secured. Buyers of store cattle reared in the area covered by the Association have welcomed the scheme, which will provide them with a guarantee of the breeding of their purchases, and this should result in mutual benefit to the rearers and the purchasers of the cattle concerned. Of the 77 premium bulls in 1931-32 in the three counties covered by the Association, 65 were Herefords and 12 Shorthorns. The schemes for the earmarking of calves by the Bletchley and District Live Stock Improvement Society, and by some Bull Societies in Staffordshire, continue to make satisfactory progress. These schemes in England are operating in areas where the premium bulls are of dairy breeds, and the marking of the calves is acting as an incentive to the breeders to retain the heifer calves for breeding purposes, and so improve their herds of cows.

The number of prizes won by premium bulls and their progeny at Shows in 1931 was very large, and among them are some outstanding successes. At the Royal Welsh Show the Champion of the Shorthorn breed and the Champion Welsh Black bull were both premium bulls, whilst a heifer sired by a premium bull secured a first prize at the Smithfield Fat Stock Show. At several County Shows premium bulls or their progeny carried off a large proportion of the prizes. For example, in the class for the best Shorthorn bull in Shropshire at the Shropshire and West Midland Show, all four animals at the head of the class were premium bulls; at the Royal Cornwall Show a 1st prize, three 2nd prizes and three 3rd prizes in open classes went to premium bulls; at the Buckinghamshire Show the cup for the best bull in the County, and 2nd, 3rd and 4th prizes in open classes, were secured by premium bulls; at the Royal Cornwall Show the champion Guernsey cow was sired by a premium bull, and three other 1st prizes and three 2nd prizes for cows or heifers went to the progeny of premium bulls; while a heifer sired by a premium bull was 2nd in its class at the Suffolk Show. While such successes bring credit to the Bull Scheme, the classes for the progeny of premium bulls at local Shows and at small Shows organized by Bull Societies are of special interest, and are probably of more value than Show winners in demonstrating to small farmers the practical benefits of the Scheme.

Breeds and Prices.—The following table shows the number and average prices of the premium bulls of each breed in each of the last three years :—

NUMBERS AND AVERAGE PRICES OF BULLS OF EACH BREED

<i>Breed</i>	1929-30		1930-31		1931-32	
	<i>No.</i>	<i>Average price</i>	<i>No.</i>	<i>Average price</i>	<i>No.</i>	<i>Average price</i>
		£ s. d.		£ s. d.		£ s. d.
Aberdeen-Angus ..	13	46 8 11	10	47 15 10	8	43 15 6
British Friesian ..	1	47 5 0	3	65 4 0	3	65 4 0
Devon	168	53 5 4	183	53 12 2	185	52 2 2
Galloway	1	24 3 0	2	24 11 6	2	36 2 6
Guernsey	16	41 10 7	17	43 11 10	20	43 18 10
Hereford	175	46 10 6	186	47 1 6	193	44 18 2
Lincoln Red ..	176	47 8 10	175	49 2 10	162	46 6 4
Red Poll	2	41 0 0	1	42 0 0	1	40 0 0
Shorthorn ..	800	49 5 9	842	48 4 1	795	46 11 4
South Devon ..	8	44 17 7	8	54 19 3	9	52 17 3
Sussex	5	40 6 5	7	41 5 3	7	34 16 3
Welsh Black ..	74	33 3 2	71	31 3 5	69	32 15 5
All breeds ..	1,439	48 3 4	1,505	47 19 6	1,454*	46 6 5

* 1,494 bulls were located, but grants in respect of 40 were in suspense at the end of the year.

More than half the premium bulls are Shorthorns, while Herefords, Devons, Lincoln Red Shorthorns and Welsh Blacks constitute the great majority of the remainder. In considering the number of bulls of the different breeds in respect of which grants are made, it should be remembered that the choice of breed is a matter for the Society, although the Ministry requires to be satisfied that most of the cows that will be brought to the bull for service are of the same breed or type as the bull. It is only by grading up within a breed that progressive improvement can be secured by the successive use of good bulls. The Ministry has, however, in a few instances awarded grants to Societies providing beef bulls, where the cows are not of the same breed as the bull and it is the practice of members to buy in all their cows and produce calves to be reared for fattening. In such cases the use of really good bulls, which is made possible by means of the grants, leads to the production of better cross-bred cattle than would otherwise be obtained, but, as the benefit to the industry is limited, seeing that no cumulative effect on the live stock of the area is secured, only a very small number of the grants available is used in this way.

Service Fees.—The service fees charged for the use of the premium bulls are shown below :—

Year	2/6	3/-	3/6	4/-	4/6	5/-	5/6	6/-	6/6
1929-30	77	53	39	103	11	855	15	111	4
1930-31	70	53	46	111	13	896	12	126	10
1931-32	71	57	45	128	13	846	12	119	12
Year	7/-	7/6	8/-	8/6	9/-	9/6	10/-	10/6	
1929-30	7	139	8	1	—	—	13	3	
1930-31	4	144	6	2	—	—	10	2	
1931-32	4	130	6	2	—	—	8	1	

The tendency is for the service fees to be reduced. There was a decrease in 1931-32 in the number of bulls in respect of which service fees of more than 5s. per cow were charged, and an increase in the number in respect of which the service fees were less than 5s. per cow.

Boars.—The number of premium boars in service at the end of March, 1932, was 1,024, or 23 less than a year earlier. On grounds of economy it will be necessary, as indicated earlier, to reduce this number to 1,000.

NUMBER OF BOARS SUBSIDIZED EACH YEAR SINCE THE COMMENCEMENT OF THE SCHEME

Year (April 1—Mar. 31)	No. of boars	Year (April 1—Mar. 31)	No. of boars
1914-15	115	1923-24	638
1915-16	193	1924-25	655
1916-17	216	1925-26	710
1917-18	264	1926-27	844
1918-19	350	1927-28	907
1919-20	399	1928-29	933
1920-21	441	1929-30	972
1921-22	550	1930-31	1,047
1922-23	569	1931-32	1,024

The average number of services per boar in service years expiring in 1931-32 was 64, an increase of 4 as compared with 1930-31 and 13 more than in 1929-30.

Premium boars account for only 4 or 5 per cent. of the total number of boars in the country, but they have a greater effect on the general quality of the ordinary pig keepers' stock than this percentage would indicate. Pigs breed rapidly, so that good numbers of improved stock, the progeny of premium boars, are regularly available for sale and distribution. As evidence of the value of the Boar Scheme it may be mentioned that in May, 1927, a grant was awarded for a district in a west midland county where the class of pigs was reported to be bad and much in need of improvement. The approved boars since provided have served from 100 to 150 sows per year, and after four years the standard of the pigs in the district was reported to have improved considerably, while the pigs bred were in keen demand.

It is frequently reported that the quality of the pigs exposed in the markets shows great improvement in areas where boars have been located under the Scheme for a few years, and that litters by premium boars command the top prices when offered for sale. Some good prices are also secured for the progeny of premium boars out of pedigree sows. A boar so bred has recently been sold for 26 guineas, while four young boars from a litter averaged 12 guineas each. Premium boars and their progeny do not figure so frequently at Shows as is the case with bulls, but at the Great Yorkshire Show two 1st prizes and a 2nd prize, and at the Royal Lancashire Show a Championship, two 1st prizes and a 2nd prize went to the progeny of a premium boar located in a northern county.

Breeds and Prices.—The very low prices at which pigs have been selling during the past year is reflected in the prices paid for the premium boars in location during the year. The average price of all the boars located was £12 9s. 7d., a decrease of 16s. 6d. per head.

The Large White is by far the most popular breed amongst owners and users of premium boars, and accounted for 77 per cent. of the boars located under the Scheme in 1931-32 against 75 per cent. in 1930-31, and only 32 per cent. ten years ago.

NUMBER AND AVERAGE PRICES OF BOARS OF EACH BREED

<i>Breed</i>	1929-30		1930-31		1931-32	
	No.	Average price	No.	Average price	No.	Average price
		£ s. d.		£ s. d.		£ s. d.
Berkshire	24	12 18 2	20	12 14 5	18	11 7 1
Cumberland	46	13 2 4	51	13 8 8	39	12 1 6
GloucesterOldSpots	4	15 10 3	2	20 5 0	2	15 5 0
Large Black	44	11 14 3	37	11 19 6	33	11 1 8
Large White	665	13 2 11	775	13 8 5	769	12 12 4
Large White Ulster	6	10 19 0	5	13 12 0	3	15 0 0
LincolnCurlyCoatd.	21	10 5 7	17	11 11 9	17	9 19 1
Long White Lop-eared	53	11 7 6	51	13 9 7	42	12 12 10
Middle White	70	12 5 8	57	12 19 4	59	12 10 6
Tamworth	1	9 0 0	1	9 0 0	—	—
Wessex Saddleback	10	12 13 5	8	13 1 2	10	11 10 11
Welsh	3	10 13 4	9	12 12 11	8	13 2 5
All breeds	947	12 18 7	1,033	13 6 1	1,000*	12 9 7

* 1,024 boars were located, but grants in respect of 24 were in suspense at the end of the year.

Service Fees.—The tendency to charge lower service fees, which was noted in the case of bulls, is also apparent with boars. Service fees of less than 5s. were charged in respect of 122 boars in 1931-32 against 117 in the previous year, and the number of service fees above 5s. was reduced from 165 to 153.

Year			2/6	3/-	3/6	4/-	4/6	5/-
1929-30	..	..	3	9	17	63	6	690
1930-31	..	..	3	9	20	76	9	751
1931-32	..	..	3	10	26	75	8	725
Year			5/6	6/-	6/6	7/-	7/6	10/-
1929-30	..	..	2	72	5	2	73	5
1930-31	..	..	2	78	5	2	69	9
1931-32	..	..	1	75	3	3	65	6

Rams.—The number of grants made in respect of rams provided under the scheme for the improvement of Welsh Mountain Sheep was reduced to 24 in 1931-32 against 27 in 1930-31. Much interest is taken in this scheme by owners of mountain flocks in Wales, and, owing to the marked improvement in some hill flocks owing to more careful breeding and management, many flock masters are now using better types of rams than formerly. Increasing use is made of rams sired by premium rams, and the cumulative effects of the scheme are becoming noticeable. The champion ram at the Aberystwyth sale in 1931 was purchased for use by one of the subsidized Societies, while the ram that secured the Championship of the breed at the Royal Welsh Show last year was used under the Scheme in 1929.

The hiring fees of the rams used in 1931-32 ranged from £6 to £12, and averaged over £9 10s. per ram. The average number of ewes served per ram was 60, and the service fees varied from 1s. to 3s. 6d., the average being 1s. 3d. per ewe.

Horse Breeding : Heavy Horses.—There was a further appreciable increase in 1931 in the number of heavy stallions in respect of which grants were paid by the Ministry, the total being 159, an increase of 19 as compared with 1930. Only 5 additional Societies received grants, the increase in the number of stallions being mainly due to several Societies hiring additional stallions in order to meet demands for extensions of the areas travelled by the Societies' stallions. The number of mares served per stallion also showed an increase, the average per stallion being 89 against 87 in 1930 and 85 in 1929.

<i>Service season</i>	<i>No. of stallions</i>	<i>Total No. of mares served</i>	<i>Average No. of mares served</i>	<i>No. of assisted nominations</i>	<i>Average hiring fee of stallions</i> £	<i>Average service fee</i> £ s. d.
1914	72	6,365	68	1,503	231	2 8 6
1915	97	9,122	94	2,430	241	2 9 6
1916	108	9,995	92	2,181	244	2 11 0
1917	110	10,556	96	2,151	258	2 16 3
1918	122	12,281	100	2,165	285	2 15 8
1919	118	10,920	96	1,996	317	3 6 3
1920	105	9,133	87	1,839	345	3 13 1
1921	101	7,888	78	1,943	333	3 13 7
1924	87	6,098	70	*	178	2 7 0
1925	96	7,413	77	1,723	194	2 8 4
1926	98	8,165	83	2,171	208	2 8 6
1927	105	8,950	85	2,599	211	2 8 9
1928	114	9,792	86	2,805	217	2 9 4
1929	120	10,196	85	3,052	221	2 9 9
1930	140	12,248	87	3,604	239	2 11 1
1931	159	14,226	89	4,266	235	2 10 2

* No grant was made by the Ministry for assisted nominations (except to the Cumberland and Westmorland Society) for the service season 1924.

The above figures do not include those relating to the Cumberland and Westmorland Society, which issues assisted nominations to selected stallions travelled by their owners in these counties. The numbers of such nominations issued by this society each year since its formation in 1915 have been as follows:—

<i>Service Season</i>	<i>No. of assisted nominations</i>	<i>Service Season</i>	<i>No. of assisted nominations</i>
1915	385	1925	197
1916	394	1926	220
1917	328	1927	247
1918	321	1928	281
1919	264	1929	283
1920	254	1930	269
1921	255	1931	290
1924	121		

The total number of mares served under the Scheme in 1931 was 14,516, an increase of 2,000, or 16 per cent. as compared with 1930. Assisted nominations were awarded to 4,556 small farmers, or 683 more than in the previous year.

The breeds of the stallions hired by subsidized Societies were Shires 126, Clydesdales 20 and Suffolks 13. As compared with 1930, Shires increased by 7, Clydesdales by 3 and Suffolks by 9, the increase in Suffolks being relatively large. In 1930 there were in the Eastern Counties only three Societies that travelled Suffolk stallions, and one of them had been formed that year in Norfolk and travelled two stallions.

This Society had a successful first season, and in 1931 extended its operations to such an extent that 7 stallions were hired, and the stallions were generally well supported. In the County of Suffolk two new Societies have been formed in the last two years to travel Suffolk stallions.

The hiring fees that Societies are able to pay for their stallions vary according to the number of mares available for service and the fee their members are prepared to pay for a service, but Societies generally make every effort to secure as good class stallions as possible, and some of the more successful Societies are able to hire stallions of high merit. The hiring fees ranged from £120 to £420, and averaged £235 in 1931, and the service fees ranged from £1 7s. 6d. to £4 4s., and averaged £2 10s. 2d.

The Heavy Horse Societies are the means of introducing into many districts much better class stallions than would otherwise be available, and at local stallion parades the subsidized stallions are often the best animals exhibited. The provision of these good stallions at moderate service fees is a source of encouragement to farmers to breed from their mares, particularly in the case of the small farmers (4,556 in number in 1931) who receive assisted nominations and are so enabled to have their mares served at reduced fees. The assistance given by the Ministry is much appreciated by farmers and will, it is hoped, tend to prevent any further decline in heavy horse breeding. Reports received by the Ministry indicate that, but for the grants, very many Societies would not be able to continue their operations.

The foaling results from the services of the stallions travelled in 1930 were not quite so good as in the previous year, the number of mares that proved in foal being 58·2 per cent. of the number served, against 59 per cent. in 1929. Many prizes were won at local shows in 1931 by foals sired by subsidized stallions, and at the Royal Show two foals secured first and second prizes respectively.

Horse Breeding Act, 1918.—The number of stallions licensed under the Horse Breeding Act, 1918, in England and Wales, for the 1931 service season, was 1,432, and there was therefore practically no change as compared with the previous two seasons. Heavy stallions, however, increased by 16 to 1,103, while the number of light stallions declined by 14 to 329. The number of licences issued and the number of refusals in each year since the Act came into force have been as follows :—

<i>Year (ending October 31)</i>	<i>No. of applications for licences</i>	<i>No. of licences issued</i>	<i>No. of refusals</i>
1920	4,153	3,749	404
1921	4,060	3,816	244
1922	3,644	3,479	165
1923	2,897	2,761	136
1924	2,285	2,210	75
1925	1,908	1,849	59
1926	1,664	1,608	56
1927	1,574	1,537	37
1928	1,454	1,414	40
1929	1,472	1,436	36
1930	1,472	1,430	42
1931	1,470	1,432	38

The increase in heavy stallions was in Shires and Percherons, the former numbering 761 against 752 in 1930 and the latter 48 against 42. The number of Clydesdales was unchanged on the year at 128, while Suffolks decreased from 139 to 134. The reduction in the number of light stallions was mainly in Hackneys, which numbered 26 against 32 in 1930, and Ponies, which declined by 12 to 85. The steady increase in the number of Thoroughbred stallions that had been recorded each year since 1926 was maintained, and 188 stallions of this breed were licensed, an increase of 4 over 1930 and the largest number since the Act came into force.

The number of stallions in respect of which licences were refused for the 1931 season was 38, or 4 less than in the previous year, and the reasons for their rejection were as follows :—

Roaring ..	11	Ringbone	3*
Whistling ..	9	Stringhalt	2
Sidebone ..	6*	Bone spavin	1
Cataract ..	3	"Tubed" and could not	
Shivering ..	3	be examined for wind	1

* One stallion was affected with sidebone and ringbone.

Of the 38 rejected stallions 29 were of heavy breeds and 9 of light breeds, the percentage of refusals being very similar in each case at slightly over $2\frac{1}{2}$ per cent. Appeals against refusals were lodged in 11 cases, and 6 appeals were successful.

The number of infringements of the Act reported to the Ministry during the season was 24, or 10 more than in 1930. Successful proceedings were taken by the Police in 5 instances in which unlicensed stallions were being travelled for service, while in 19 cases where licensed stallions were being travelled or exhibited for service unaccompanied by the licences the owners and leaders of the stallions were warned as to the requirements of the Act in this respect.

Milk Recording.—The number of members of Milk Recording Societies in each year since 1917-18, when all Societies were

required to adopt a uniform milk-recording year, together with the number of herds and cows recorded, have been as follows :—

<i>Year ended</i>	<i>Societies</i>	<i>Members</i>	<i>Herds</i>	<i>Cows</i>
<i>October 1</i>				
1917-18	27	639	708	19,793
1918-19	38	1,191	1,332	37,880
1919-20	46	2,075	2,312	61,323
1920-21	52	3,328	3,664	97,903
1921-22	55	3,949	4,362	117,023
1922-23	55	4,365	4,767	127,151
1923-24	52	4,764	5,209	138,086
1924-25	50	5,081	5,516	148,905
1925-26	49	5,174	5,656	154,322
1926-27	51	5,166	5,650	156,847
1927-28	50	4,862	5,320	149,971
1928-29	50	4,616	5,065	144,812
1929-30	49	4,501	4,934	140,266
1930-31	49	4,412	4,836	137,866

The decline in membership, which set in in 1926-27, has been continued, but each year since 1927-28 the rate of decrease has slackened. As has been indicated on previous occasions, the decrease in official milk recording is due to the reduced financial circumstances of farmers, which have caused a certain number of herd owners to resign their membership of Milk Recording Societies in order to reduce their outgoings, rather than to any loss of faith on the part of these farmers in the value of milk recording. In fact, a large number of herd-owners who resign from Milk Recording Societies continue to record their herds privately, and the number of privately recorded herds is considerable. The position in a group of counties in the east Midlands, which led the Live Stock Officer of the district to remark that it is surprising to see the number of farms on which unofficial milk recording is carried on, is typical of many parts of the country. While private recording, if carefully and systematically carried out, provides the herd-owner with the information necessary for the weeding out of cows that give unsatisfactory yields, and for the economic rationing of the herd, it has to be remembered that when records are taken under the supervision of a Milk Recording Society and are therefore subject to independent check, they usually have a higher commercial value than private records in connexion with the trade in dairy cattle. The efforts of breeders to improve the milking capacity of the dairy cattle bred by them would be seriously hampered if they could not ensure, by reference to authenticated records, that the bulls they purchase for use in their herds are descended from cows of heavy-milking strains.

Average Yield of Recorded Cows.—In 1929-30 the average yield of milk given by recorded cows exceeded 700 gallons for the first time on record, but the high average yield of that year was exceeded in 1930-31 and a new record of 719 gallons per cow was established.

Year October 1 to October 1	Particulars of all cows and heifers recorded			Particulars of cows recorded for full year			
	No. of cows and heifers	Total yield	Average yield*	No. of cows	Per- centage of total cows and heifers	Total yield	Average yield*
		Gal.	Gal.			Gal.	Gal.
1917-18 ..	19,793	8,426,958	426	8,775	44	5,255,923	599
1918-19 ..	37,880	16,204,941	450	17,989	47	10,543,516	579
1919-20 ..	61,323	29,344,887	479	27,266	44	17,363,347	637
1920-21 ..	97,903	48,512,380	495	48,248	49	30,892,620	640
1921-22 ..	117,023	60,463,617	517	63,318	54	41,208,073	651
1922-23 ..	127,151	67,904,224	534	68,349	54	46,956,565	687
1923-24 ..	138,086	73,963,165	535	73,338	53	50,299,884	685
1924-25 ..	148,905	76,419,498	*513	77,132	51	51,695,291	*670
1925-26 ..	154,322	81,623,788	*529	81,669	53	56,102,434	*687
1926-27 ..	156,847	82,161,809	*524	81,749	52	55,677,261	*681
1927-28 ..	149,971	76,896,131	*513	77,171	51	51,931,633	*673
1928-29 ..	144,812	75,948,485	*524	74,171	51	51,207,594	*690
1929-30 ..	140,266	75,293,001	*537	71,432	51	50,766,464	*711
1930-31 ..	137,866	75,357,035	*547	71,480	52	51,386,105	*719

* Before 1924-25 the average yield was calculated at the equivalent of 10½ lb. to a gallon, and subsequently at 10¼ lb.

The average yield of full-year cows in 1930-31 of 7,429 lb. (719 gallons) was 85 lb. (over 8 gallons) more than in 1929-30, and 295 lb. (28½ gallons) more than in 1928-29. Four Societies had average yields exceeding 8,000 lb. (774 gallons) per cow as compared with 3 Societies in 1929-30, and 24 Societies secured average yields exceeding 7,500 lb. (726 gallons) against 21 in the previous year, while five years ago only 6 Societies had average yields of more than 7,500 lb. The four Societies with average yields exceeding 8,000 lb. were Norfolk, Essex, Derby and Glamorgan.

The number of individual herds with average yields for full-year cows of 8,000 lb. (774 gallons) or over was 1,420, or more than 32 per cent. of the total number of herds recorded for the full year, as compared with 30 per cent. in 1929-30 and only 20 per cent. in 1927-28. Herds with averages of 10,000 lb. (968 gallons) or over numbered 257, an increase of 6 on the year. Some examples of the increases effected in the average yields of herds as a result of recording, together

with the cash values of the increased yields calculated at the rate of 1s. per gallon, are shown in the following table :—

Herd	No. of years during which records have been taken	Average yield per cow in first year	Average yield per cow in last year	In-crease in annual average yield per cow	No. of full year cows in last year of period	Cash value of increase of last year over first year at 1s. per gallon	
						Per cow	Per herd
A (Mainly Non Pedigree Short horn)	7	Gal. 597	Gal. 921	Gal. 324	30	£ 16 4	s. 866 0
B (Mainly Non Pedigree Short-horn)	4	653	881	228	31	11 8	353 8
C (Non-Pedigree Red Poll)	5	806	1,184	378	17	18 18	321 6
D (Pedigree Red Poll)	6	558	943	385	13	19 5	250 5
E (Pedigree Jersey) . .	7	575	868	293	9	14 13	131 17

Although the total number of cows recorded in 1930-31 was 2,400 less than in the previous year, the number that reached the standard yield of their breed or type increased from 17,008 to 18,268. Shorthorn cows that gave 9,000 lb. of milk or over increased in number from 9,303 to 9,619, and Friesians that gave 10,000 lb. of milk or over increased from 4,003 to 4,494. There were relatively larger increases in the number of Guernseys and Ayrshires that reached the standard yields of their breeds, there being 1,167 Guernseys, an increase of 236 on the year, and 484 Ayrshires, an increase of 93. The number of cows that gave yields of 10,000 lb. or over was 11,021, an increase of 1,052 on the year, while 39 cows yielded over 20,000 lb. against 26 in 1929-30.

The number and average yield of cows of certain breeds recorded during 1930-31 are given in the next table. There was a decrease of about 3,300 in the number of Shorthorns recorded as compared with 1929-30, but Friesians were practically unchanged in numbers, while Guernseys and Ayrshires showed fairly large increases of 620 and 500 respectively, and there were also increases in the numbers of Jerseys and Red Polls. Increased average yields were given by cows of each breed except Welsh Blacks. Friesians, with an average yield of 8,900 lb., showed an increase of 198 lb.

NUMBER OF COWS THAT GAVE THE STANDARD YIELD PRESCRIBED FOR THEIR BREED OR TYPE DURING THE YEAR ENDED OCTOBER 1, 1931, CLASSIFIED ACCORDING TO BREED AND YIELD.

Breed or type	Stand-ard yield lb.	Yields (in lb.)								Total number of cows giving the stand-ard yield
		8,000 to 9,000	9,000 to 10,000	10,000 to 11,000	11,000 to 12,000	12,000 to 14,000	14,000 to 16,000	16,000 to 20,000	Over 20,000	
Ayrshire ..	9,000	—	216	138	73	45	7	4	1	484
Blue Albion	9,000	—	61	42	26	17	2	—	1	149
Devon ..	8,000	46	23	10	8	3	—	—	—	90
Friesian ..	10,000	—	—	1,703	1,080	1,098	390	189	34	4,494
Guernsey ..	8,000	603	318	148	49	36	11	2	—	1,167
Jersey ..	8,000	284	145	76	31	23	2	1	—	562
Lincoln Red										
Shorthorn	9,000	—	167	68	45	36	10	2	—	348
Red Poll ..	9,000	—	352	192	84	77	22	2	—	729
Shorthorn ..	9,000	—	4,592	2,627	1,315	839	171	72	3	9,619
South Devon	8,000	159	103	61	37	18	6	2	—	386
Welsh Black	8,000	43	24	14	7	6	—	—	—	94
Other Breeds	8,000	*77	34	17	10	7	1	—	—	146
Totals ..	—	*1,212	6,035	5,116	2,765	2,205	622	274	39	18,268

* Includes 13 Dexter cows with yields of 7,000 to 8,000 lb. (Standard yield for Dexters is 7,000 lb.)

over 1929-30; other breeds with average yields more than 100 lb. in excess of the previous year were Guernseys, Red Polls and Lincoln Reds.

Breed or type	Total number of cows and heifers recorded	Particulars of cows recorded for full year			
		Number	Percentage of total cows and heifers	Total yield	Average yield
				lb.	lb.
Ayrshire ..	3,075	1,642	53.3	12,472,504	7,596
Blue Albion .	937	497	53.0	3,779,302	7,604
Devon ..	1,192	703	58.9	4,120,209	5,861
Friesian ..	22,275	12,268	55.0	109,184,100	8,900
Guernsey ..	9,398	4,440	47.2	29,054,216	6,544
Jersey ..	5,352	2,635	49.2	16,589,474	6,296
Lincoln Red .	2,312	1,225	52.9	9,266,808	7,565
Red Poll ..	5,739	3,314	57.7	24,047,541	7,256
Shorthorn ..	82,296	42,023	51.0	304,707,316	7,251
South Devon	2,346	1,128	48.0	7,709,703	6,835
Welsh Black.	962	554	57.5	3,318,026	5,989

Issue of Certificates.—The number of applications for Certificates of Merit was greatly increased in the year under review, and the number issued in respect of the three years ended October 1, 1931, was 465, as compared with 278 in respect of the previous three years, an increase of 67 per cent. In addition, 49 Certificates of Merit were issued during the past year in respect of earlier three-year periods against 10 in the previous year, making a total of 514 such certificates issued during the year, or an increase of 78 per cent. It is evident that these certificates, which are only awarded in respect of cows that have not only given the prescribed yield for their breed or type but have also been regular breeders during the three-year period, are of value to the owners of the cows. The large increase in the number of applications this year is, however, probably due to some extent to the entry of cows in the Register of Dairy Cattle being now confined to cows in respect of which Certificates of Merit have been issued. The highest yields certified for the three years ended October 1, 1931, were 54,481 lb. given by a Friesian cow, 51,112 lb. and 50,152 lb. yielded by Shorthorn cows and 48,193 lb. by a Red Poll cow. The highest yields certified for other breeds were, Guernsey, 42,879 lb.; Ayrshire, 41,548 lb.; Lincoln Red Shorthorn, 40,210 lb.; Blue Albion, 39,496 lb.; Jersey, 36,515 lb.; and Park Cattle, 36,012 lb. Of the 465 cows in respect of which Certificates of Merit were issued for the period ended October 1, 1931, 91 gave yields of over 35,000 lb. during the three years.

Certificates of Milk Record in respect of the yield of one year only are in little demand and only 16 such certificates were issued during the year.

Register of Dairy Cattle.—Volume XV of the Register of Dairy Cattle was published early in June, and contains particulars of the 514 cows in respect of which Certificates of Merit had been issued since the publication of the previous Volume, and of 20 pedigree dairy bulls. Of these bulls 9 qualified for entry on the basis of the yields given by their dams and sires' dams and 11 on the basis of the yields of two or more of their daughters.

Calf and Bull Marking.—Increased advantage was taken in 1930-31 of the Ministry's scheme for the ear-marking and registration of calves of milk-recorded cows, the number of calves marked during the year being 14,391 against 13,680

in 1929-30. Most of the calves marked were again heifer calves, less than 1,100 being bull calves. As compared with the total number of cows recorded, earmarking of calves under the scheme is most frequently adopted by the members of the Kendal and South Westmorland Society and the South Devon Society; in 1930-31 the former Society recorded 790 cows and marked 262 calves, and the latter recorded 2,406 cows and marked 723 calves. The number of bulls being used for service that were marked by Societies for their members in 1930-31 was 43.

Testing for Butter Fat.—More attention is being given by members of Milk Recording Societies to the quality of the milk produced by their cows, and during 1930-31 155,272 samples were taken by recorders for testing for butter fat—an increase of 27,395 as compared with the previous year. Of the total number of samples, over 125,000 were in respect of the milk of individual cows.

Rationing.—The economic rationing of a dairy herd is only possible if the quantity of milk given by the cows is accurately known, and members of Milk Recording Societies are encouraged to give attention to this aspect of the management of their herds. Live Stock Officers and officials of the Societies explain the advantages that may be obtained from careful rationing. Advice on the composition of rations is obtainable from County Agricultural Organizers and other authoritative sources, and such advice is freely sought by a large proportion of the members of Milk Recording Societies.

Cost of Milk Recording.—There was again practically no change in 1930-31 in the average cost of milk recording per cow over the whole country. The average amount paid by the members of the Societies was 4s. 3d. per cow, while the Ministry's grants averaged 2s. 1d. per cow.

The following memoranda, which give detailed information concerning the Ministry's Live Stock Improvement Scheme, can be obtained (single copies free of charge) on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1 :—

Form No. A763/T.L.	Scheme for the Improvement of Live Stock.
Form No. 609/T.L.	Bull Grant Regulations.
Form No. 466/T.L.	Boar Grant Regulations.
Form No. 89/T.L.	Heavy Horse Regulations.
Form No. 392/T.L.	Milk Recording Regulations.

MILK RECORDING SOCIETIES

Statement giving particulars of the 49 Milk Recording Societies operating during the year ended October 1, 1931. (The Societies are arranged in order of total number of cows recorded.)

SOCIETY	*No. of members	*No. of herds	Total No. of cows recorded	No. of cows recorded for full year	Average yield of cows recorded for full year
					lb.
Essex County	194	226	9,124	4,564	8,010
Suffolk	288	325	8,612	4,824	7,947
Hampshire	189	223	7,552	4,021	6,966
East Sussex	221	249	7,271	3,754	7,053
Norfolk	216	235	6,705	3,938	8,284
Somerset and North Dorset	184	210	6,540	3,708	7,056
Berkshire	159	190	6,273	3,267	7,278
Hertfordshire County ..	169	191	5,728	2,673	7,567
North Wilts	88	105	4,598	2,578	6,967
Kent	132	150	4,246	2,168	7,199
Surrey	132	140	3,934	1,918	7,120
West Sussex	111	124	3,901	2,016	7,818
Dorset	53	80	3,514	2,202	6,719
Lancashire County	103	108	3,299	1,286	7,257
Oxfordshire	99	105	3,270	1,646	7,550
Gloucestershire	97	105	3,103	1,777	7,345
Shropshire	79	80	3,093	1,661	7,592
Warwickshire	114	121	2,995	1,488	7,523
Leicestershire and Rutland	97	102	2,659	1,333	7,512
Buckinghamshire	93	104	2,598	1,243	7,632
South Devon and District..	105	109	2,406	1,143	6,834
Yorkshire	91	96	2,405	1,039	7,567
Cheshire County	61	66	2,315	983	7,495
Derby and District	62	63	2,006	830	8,109
Cambridgeshire and District	68	77	2,002	1,168	7,628
South Wilts	33	43	1,948	1,214	7,352
Staffordshire	60	61	1,922	940	7,773
Cumberland and N. Westmorland.	93	94	1,795	762	6,068
Worcestershire	76	77	1,770	865	7,676
Northamptonshire	64	71	1,699	834	7,411
Bristol and North Somerset	71	76	1,692	1,012	7,397
Bedfordshire	54	56	1,613	825	7,755
Nottinghamshire	47	50	1,459	605	7,725
Lincolnshire	39	43	1,283	656	7,779
Northumberland	54	56	1,263	642	7,956
Peak (Derby)	50	51	1,230	509	7,558
East Devon	65	65	1,158	712	6,761
Durham County	39	41	1,133	517	7,402
Cornwall	62	64	1,067	579	6,372
Denbighshire and Flintshire	41	41	922	549	7,529
Herefordshire	39	39	899	483	7,922
Monmouthshire and Brecon ..	42	42	837	399	7,653
Kendal and South Westmorland ..	38	38	790	317	5,966
Anglesey and Caernarvonshire	54	55	706	407	5,703
Campden, Moreton & Dist. (Glos.)..	29	29	675	331	7,327
Glamorganshire	35	35	559	334	8,374
Cardiganshire	23	25	558	327	7,051
Cardiganshire	40	41	433	213	6,421
Pembrokeshire	18	18	306	220	6,795
TOTALS	4,371	4,795	137,866	71,480	7,429

* Herds of goats are not included.

AUGUST ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

Wheat.—The grower of wheat has a special interest in the harvesting of his grain this year. By the Wheat Act, the wheat that is sold and is of millable quality will carry the right to a deficiency payment that is the difference between the average price of wheat for the year throughout the country and 45s. per 4½ cwt., less the cost of administration. The farmer will, however, market his wheat at the best price he can make.

The inducement to the farmer to grow, harvest, thrash and market his wheat in the best possible condition is twofold : (1) he is entitled to deficiency payments in respect only of wheat sold that is of millable quality, and (2) the better price he can get for his wheat the more likely is he to obtain a price equal to or above the average for the country, and still receive the same deficiency payment as those who sold their wheat at a lower price. The position is no longer one of accepting a shilling or two below current prices for out-of-condition wheat and letting the matter end there ; the question of millable quality arises, and unless the bulk is of such quality the deficiency payments would not be obtainable and the selling price would be all the farmer would receive.

Condition of wheat is largely dependent on weather conditions before and during harvest, but everything should be done to overcome the influence of weather and secure the wheat in the best possible condition. Wheat should not be cut until the grain is quite firm. Too early cutting results in shrivelled grain and a consequent reduction in yield. On the other hand, if the crop is allowed to become too ripe there is likely to be a serious loss from the shedding of the grain. Where an extensive acreage has to be dealt with it is impossible to get the whole cut at the best stage, and unfavourable weather may so delay operations as to cause some to be over-ripe before cutting, and thus entail some loss.

The crop should be dry when cut. The size of the sheaf should vary with the prevailing conditions. Long straight straw, clear of weeds or grass, can be easily dried in the shock or stook, and big sheaves are suitable ; on the other hand, short straw and weedy or grassy conditions necessitate a smaller sheaf in order to give a better opportunity for drying. Shocking or stooking should be done at once. It is important

to keep the heads well together so that as little of the grain as possible is exposed to bad weather. Where grass or clover is present in the butts of the sheaves not more than six sheaves should be put to each shock, and whilst the heads should be kept well together the butts may be slightly separated to help drying. Wheat that is ripe when cut and is clear of grass and weeds does not require to stand long in the shock, but wherever there is green material this must be quite dead and dry before being stacked. When wheat has become quite dry, a little subsequent damp from dew or even slight rain will not injure the grain in the stack, and in this respect it differs materially from barley or oats.

Stacking.—The site for the stack should be carefully selected and prepared. A dry foundation is essential. The grain should be protected from damp by a heavy bedding of straw, brushwood, or faggots, or, better still, a special staddle or frame on mushroom-shaped uprights should be used. The latter, in addition to preventing damp, are some protection against rats and mice. In building the stack care should always be taken to keep the centre well up so that the outside straws will point downwards and so shed off rain and avoid any wet entering the rick. The heading of the stack should have special attention in this respect, but no matter how well the rick is built some additional covering is necessary as a precaution against waste of grain. Even if it is the intention to thrash soon, a lot can happen in ten days, and where a number of farmers are dependent on one contractor to do their work, ten days may become twenty before thrashing is possible. Thatching of stacks is done in different ways in different parts of the country, but the object is the same. Neatly-thatched ricks are usually associated with good farming.

Thrashing.—The better the condition when carted, the sooner will the wheat be fit to thrash. Under dry conditions it can be thrashed straight from the field, and a dry, good keeping sample of wheat may be expected. On the other hand, once the wheat has been stacked there is a tendency for the wheat to soften, no matter how dry it was when stacked, and it must be allowed to harden off before thrashing. Even under good conditions, thrashing under ten days from stacking is seldom advisable. Except for the “come back” that takes place during the first few days, wheat properly stacked and thatched should improve, at any rate for the first six months of storage, and after an unfavourable harvest

period much of the wheat may require three months' storage or even longer to bring it into good condition. Wheat, however, and other grain as well, can be conditioned by artificial drying, but it is essential that this should be done immediately after thrashing. It is not always safe to rely on the harvester-thresher without an artificial drying plant being available.

Marketing.—In order to ensure good milling quality the farmer should refrain from thrashing until the wheat is dry in the stack. A careful watch should be made for damp corn at both the tops and the bottoms of the ricks. If a number of sacks are decidedly damp they should be emptied out on a wooden floor and turned repeatedly until they can be mixed with the other grain without doing damage. Bulking of the grain and taking great care to keep out damp sacks may be well worth while if such means enable the bulk to be kept in the milling quality class. The difference this year may not only be the saving of the few shillings that may have been deducted in the past for damp sacks, but also the increase obtainable if the grain comes within the scope of deficiency payments.

Harvesting of Oats.—Oats should not be allowed to become too ripe before cutting. Some varieties shed their grain very readily, and the grains that fall first and most readily are the best in size and quality. Where the straw is used for fodder this will be more palatable and of much better quality if cut before it is completely ripe. By cutting a little early the crop may be allowed to ripen in the shock, and the total yield of grain will be higher. Too early cutting, however, should be avoided, or the grains will be thin and light. The best stage is that in which there is a uniform yellow colour when the crop is standing, but a decided tinge of green is noticeable when the grain is gathered into a sheaf. Except that oats require longer time in the shock and should be thoroughly dry when stacked, the harvesting proceeds as for wheat.

Harvesting of Barley.—It is important that barley should be fully ripe before it is cut. The straw should be free from any trace of greenness, and the grain quite hard and yellow and have assumed a finely wrinkled appearance. The longer the corn can be left during the final stages of ripening the higher will be the quality. Shocking should be done carefully, with the heads well together and the butts spread out so

that any green material will dry well. Carting should not be done until the whole of the material in the sheaf is quite dead and dry. Where "seeds" have been sown the butts are difficult to dry, and in such circumstances the practice of building small rickles or "huts" in the field is an advantage. This practice consists in building a small rick with about a hundred sheaves in such a way that each sheaf is nearly perpendicular, with the butts exposed and the grain covered except for the last two sheaves at the top of the hut. If the sheaves are built round a frame, drying will be quicker and building easier. Thrashing must be carefully done so that the grain is not injured, while the grain should be well screened to ensure evenness in size. Bulking should always be practised, so that when the subsequent sale is on sample the bulk can be relied on to come up to sample.

Management of Pastures.—Pastures can be managed now in such a way as to improve their autumn and early-winter feeding value. The drier fields should be selected for winter use, and be run over with the mower to take off top growth, and stock should be kept on them until they are fairly well eaten down. As soon as this has been done the stock should be moved to other fields, and the new growth that follows will be useful for flushing ewes or carrying young stock in early winter.

If the fields require manuring with phosphates or potash, or both, now is a favourable opportunity when the grass has been well eaten down. A bare condition in the pasture is absolutely necessary in order to get the full benefit of applied manures. The drainage of pastures should not be neglected, and ditches must be kept clear if quantity and quality of grass is to be obtained.

Young calves should be carefully watched for any signs of husk or hoose, and the addition of dry food before it is too late is well worth while.

PRICES OF ARTIFICIAL MANURES

Average prices per ton during week
ended July 6

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	9 0	9 0	9 0	9 0	11 7
" " Granulated (N. 16%) ..	9 0	9 0	9 0	9 0	11 3
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	5 5d	5 5d	5 5d	5 5d	5 1
Calcium cyanamide (N. 20·6%)	7 0s	7 0s	7 0s	7 0s	6 10
Kainit (Pot. 14%) ..	3 16	3 9	3 5	3 1g	4 4
Potash salts (Pot. 30%) ..	6 1	5 14	5 11	5 1g	3 5
" (Pot. 20%) ..	4 7	4 1	3 17	3 12g	3 7
Muriate of potash (Pot. 50%) ..	11 9	10 17	10 11	9 15g	3 11
Sulphate " (Pot. 48%) ..	13 12	12 19	12 16	11 8g	4 9
Basic slag (P.A. 15½%)||	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)||	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock-phosphate (P.A. 26-27½%)||	2 10a	..	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%)	3 2	..	3 5	2 17k	3 7
" (S.P.A. 13½%)	2 17	2 9	3 0	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	8 15	6 15	7 10	5 17	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 19b	5 2f	6 0	4 15	..

Abbreviations : N. = Nitrogen ; P.A. = Phosphoric Acid ; S.P.A. = Soluble Phosphoric Acid ;
Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

* * * * *

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc., (Agric.),
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Supplies of Food Stuffs.—The dry weather that has prevailed in most districts during the latter part of June and early July has enabled most farmers to secure a large proportion of the hay crop in first-class condition. The crop is generally below normal as regards bulk, but the quality, as a whole, should be good. A supply of high quality June hay should enable farmers to winter their stock with relatively less expenditure on concentrated feeding stuffs than after an unfavourable hay time. It is unlikely that concentrated foods for feeding to dairy stock next winter will be largely bought forward until the price of winter milk is fixed. If a fair price is forthcoming for winter milk farmers will be encouraged to feed for higher output, but if the winter price should prove to be low, they will, as last autumn, cut down expenditure by relying on home-grown bulky foods.

The dry weather that proved favourable for hay-making was unfavourable for the germination of the later-sown roots—swedes, turnips and kale. A considerable amount of resowing has been necessary. The mangold crop varies a good deal throughout the country. Early sowings on kindly soils have done well, but on the whole the crop is patchy and the yield of mangolds is likely to be below normal. Sugar beet pulp at £4 per ton to growers, or £4 5s. to non-growers, is fair value, and demand for pulp is likely to increase unless conditions for the root crop should materially improve.

Grass is now less nutritious, and it becomes necessary to feed the heavier milking cows with concentrates in order to prevent a considerable falling off in yield. Cattle that are nearly fat should now repay extra feeding on grass, for although the price per cwt. of fat stock has fallen in recent weeks and is not specially encouraging so far as expenditure on concentrated foods is concerned, there is still the risk that the price of fat cattle will, as usual, tend to fall as the season advances. It would therefore appear to be the sounder policy to finish off, as soon as practicable, those that are nearly ready for slaughter.

As regards current values, maize products continue to be comparatively cheap. Maize cubes are now available for outdoor feeding and are on trial at this Institute, with apparently satisfactory results. The cube form is undoubtedly an advantage as compared with meal for use out-of-doors.

Of the cakes and extracted meals, Egyptian cotton cake and palm kernel meal are best value at the time of writing. The cheap alternative to cake and extracted meals, as a source of protein, is maize gluten feed. This last-mentioned food might be used with advantage for dairy cows on grass. A suitable mixture would be equal parts by weight of cotton cake, maize gluten feed, and maize meal. For fattening stock at grass a mixture in equal parts of Egyptian cotton cake and maize cubes should prove satisfactory and economical. Flaked maize can be bought forward for winter delivery on favourable terms. Those who may require this feeding stuff on account of its suitability and high digestibility for young stock—calves, lambs and pigs—would do well to consider making their winter contracts in advance.

Millers' offals still continue dear. It has been claimed that both fine wheat feed or fine middlings and broad bran have a higher value than the usually accepted figure for their starch equivalent would appear to indicate. This may or may not be so, but one must take the figures published weekly in the Ministry's Market Report as the standard on which to make comparisons of the values of different feeding stuffs. Those figures show (July 6, 1932) that the price per unit of starch equivalent of broad bran is 2s. 3d., coarse middlings 2s., and fine middlings 1s. 9d. These figures are high in comparison with meals and cereals, except that barley meal at £7 10s. per ton is also 2s. per unit, and oats at £7 to £8 per ton are costing 2s. 2d. to 2s. 6d. per unit of starch equivalent.

The relatively high prices of wheat offals are having a remarkable effect upon pig rearing at the present juncture. With values for bacon pigs and pork pigs at recent low price levels, many pig feeders can see no possibility of feeding pigs other than at a loss. The result is that little pigs are being drowned "like kittens" at birth, and only cheaper feeding stuffs and the prospect of better prices for finished pigs can put a stop to this regrettable waste.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	6 10
Maize	81	6.8	4 17
Decorticated ground-nut cake ..	73	41.0	7 17
„ cotton cake	71	34.0	7 10

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.50 shillings, and per unit protein equivalent, 1.48 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The “food values” which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows are given in the November, 1931, issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 2
Oats	60	7.6	5 1
Barley	71	6.2	5 16
Potatoes	18	0.6	1 8
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 11
Beans	66	20.0	6 9
Good meadow hay	37	4.6	3 2
Good oat straw	20	0.9	1 11
Good clover hay	38	7.0	3 7
Vetch and oat silage	13	1.6	1 2
Barley straw	23	0.7	1 16
Wheat straw	13	0.1	1 0
Bean straw	23	1.7	1 17

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 6d. net.

DESCRIPTION	Price per qr.		Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.		Pro- tein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	6 5	0 9	5 16	72	1 7	0-85	9-6
Barley, British feeding	—	—	6 15	0 7	6 8	71	1 10	0-98	6-2
" Canadian No. 3 Western	23 0	400	6 8	0 7	6 1	71	1 8	0-89	6-2
" Argentine	25 0	"	7 0	0 7	6 13	71	1 10	0-98	6-2
" Karachi	24 0	"	6 15½	0 7	6 8	71	1 10	0-98	6-2
" Russian	22 6	"	6 7*	0 7	6 0	71	1 8	0-89	6-2
" Persian	21 9	"	6 2*	0 7	5 15	71	1 7	0-85	6-2
Oats, English white	—	—	8 7	0 7	8 0	60	2 8	1-43	7-6
" black and grey	—	—	8 0	0 7	7 13	60	2 7	1-38	7-6
" Canadian No. 2 Western	22 6	320	7 17	0 7	7 10	60	2 6	1-34	7-6
" " No. 3	21 3	"	7 8½	0 7	7 1	60	2 4	1-25	7-6
" " No. 1 Feed	20 6	"	7 3*	0 7	6 16	60	2 3	1-20	7-6
" Argentine	18 3	"	6 8	0 7	6 1	60	2 0	1-07	7-6
" Russian	21 6	"	7 10½	0 7	7 3	60	2 5	1-29	7-6
Maize, Argentine	20 9	480	4 17	0 7	4 10	81	1 1	0-58	6-8
Peas, Indian	—	—	8 0†	0 14	7 6	69	2 1	1-12	18
" Japanese	—	—	22 10†	0 14	21 16	69	6 4	3-39	18
Milling offals—									
Bran, British	—	—	5 5	0 17	4 8	42	2 1	1-12	10
" broad	—	—	5 15	0 17	4 18	42	2 4	1-25	10
Middlings, fine imported	—	—	6 17	0 12	6 5	69	1 10	0-98	12
" coarse British	—	—	6 10	0 12	5 18	58	2 0	1-07	11
Pollards, imported	—	—	6 0	0 17	5 3	60	1 9	0-94	11
Meal, barley	—	—	7 10	0 7	7 3	71	2 0	1-07	6-2
" maize	—	—	5 17	0 7	5 10	81	1 4	0-71	6-8
" " South African	—	—	5 5	0 7	4 18	81	1 3	0-67	6-8
" " germ	—	—	5 17	0 11	5 6	85	1 3	0-87	10
" locust bean	—	—	6 5	0 6	5 19	71	1 8	0-89	3-6
" bean	—	—	8 0	0 17	7 3	66	2 2	1-16	20
" fish	—	—	14 15	2 7	12 8	53	4 8	2-50	48
Maize, cooked flaked	—	—	6 10	0 7	6 3	83	1 6	0-80	8-6
" gluten feed	—	—	5 17	0 12	5 5	76	1 5	0-76	19
Linseed cake, English, 12% oil ..	—	—	8 5	1 0	7 5	74	2 0	1-07	25
" " " 9% "	—	—	8 0	1 0	7 0	74	1 11	1-03	25
" " " 8% "	—	—	7 12	1 0	6 12	74	1 9	0-94	25
Soya bean cake, 5½% oil	—	—	7 17*	1 7	6 10	69	1 11	1-03	36
Cottonseed cake—									
English, 4½% oil	—	—	4 17	1 0	3 17	42	1 10	0-98	17
Egyptian, 4½% oil	—	—	4 10	1 0	3 10	42	1 8	0-89	17
Decorticated cottonseed meal, 7% oil	—	—	8 5*	1 8	6 17	74	1 10	0-98	35
Ground-nut cake 6-7% oil	—	—	6 15*	0 18	5 17	57	2 1	1-12	27
Decorticated ground-nut cake, 6-7% oil	—	—	7 17	1 7	6 10	73	1 9	0-94	41
Palm-kernel cake, 4½-5½% oil ..	—	—	5 17½	0 12	5 5	75	1 5	0-76	17
" " meal, 4½% oil	—	—	6 7½	0 12	5 15	75	1 6	0-80	17
" " meal, 1-2% oil	—	—	5 15	0 12	5 3	71	1 5	0-76	17
Feeding treacle	—	—	5 0	0 8	4 12	51	1 10	0-98	2-7
Brewers' grains, dried ale	—	—	5 10	0 12	4 18	48	2 1	1-12	13
" " " porter	—	—	5 0	0 12	4 8	48	1 10	0-98	13

* At Bristol.

† At Liverpool.

‡ At Hull.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of June, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £30 per ton, then since its manual value is 20s. per ton as shown above, the food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22½, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1-23s. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manual value per ton are calculated on the basis of the following unit prices:—N, 5s. 1d.; P, 0s. 8d.; K, 0s. 8d.

MISCELLANEOUS NOTES

THE following note has been communicated by Mr. A. W. Oldershaw, B.Sc., Agricultural Organizer for East Suffolk :

Vetches and Other In districts chiefly devoted to grazing, great loss is sometimes caused in a dry spring or summer by the inability of farmers to provide succulent food for their cows. For example, in 1929 the

Autumn-sown grass land produced very little feed, cows fell off considerably in milk yield, and grazing stock generally suffered from the lack of the usual supply of grass. In addition the supply of hay was very short, and many farmers found it impossible to give their cows a sufficient quantity during the winter 1929-30. Farmers who, during the summer of 1929, had a fair area under forage crops such as vetches or lucerne were indeed to be envied, and the superior productivity of arable forage crops over grass, in a dry time, was made evident.

Crops Of autumn-sown forage crops none is more deservedly popular in the Eastern counties than vetches, tares or "dills" as they are sometimes called, either when grown alone or in mixture with oats or other crops. Autumn-sown vetches usually give a good crop on average land, unless they are damaged by frost—and this only happens occasionally. They do not usually suffer from drought, as their main growth takes place in the early months of the year, before the winter supplies of moisture are exhausted. They produce a large amount of green food per acre—often 12 to 15 tons, and even more. They will give a good crop even on poor land, provided this is not water-logged and that it contains sufficient lime. A water-logged condition of the soil is fatal, while lack of lime is most harmful to vetches as to many other crops. At Tunstall light-land Experimental Station, in Suffolk, the writer found in 1930 that, on a light soil with a lime requirement of 27 cwt. per acre, 5 tons per acre of chalk applied four years previously (costing in this case 50s. per acre, including application) increased the crop of green vetches about threefold.

The cultivation necessary for vetches is very simple. The crop may even be grown on land that is not very clean, provided it can be well ploughed and the weeds completely buried. If the crop is either mown for stock or folded, in fairly good time—say June or early July—there is very often a chance to give a bastard fallow to the land. Vetches grown for green food are usually removed before most weeds ripen their seed, and thus help in keeping the land clean. If easy-working land is clean, a catch-crop of turnips may be obtained after vetches.

It is important to sow autumn-sown vetches as early as possible, the last week in September or the first week in October being a good time. Where the crop is for mowing green or "soiling," a second sowing may be made a fortnight later, and a third in November. Sowings of spring vetches may be made from February onwards. In this way vetches will be available for mowing green during most of June and July in an average season. On a farm with a considerable area of grass land the crop may not be wanted very much in a showery season, but in a year of drought it will be invaluable.

If not wanted for immediate use, vetches may be made into hay or silage. Vetch hay can be made satisfactorily only in a fairly long period of fine weather, hence it is probably better on the whole to make the crop into silage. This may be done in a trench or pit silo; an expensive silo is unnecessary.

When vetches are grown for green food it is quite usual to mix them with oats, which act as a support for the vetches and are on the whole a desirable addition. A mixture of equal parts by measure of seed oats and vetches is usually satisfactory, and the crop will be found suitable for soiling, for folding, or for making into hay or silage, and may be grown with a reasonable prospect of success in most parts of Britain.

Of other autumn sown crops, rye makes a useful sheep fold in spring, while a small area is also very useful for mowing green for cattle and horses before there is much grass in early spring. Rye, however, soon gets woody and unpalatable to stock, and it is important not to sow a larger area than can be consumed in the young and succulent condition. For spring sheep feed on light land containing enough lime a mixture of 5 lb. of Italian rye-grass, 6 to 8 lb. of trifolium, and a few lb. of rape per acre, sown in August, has been found very useful in some seasons by Mr. S. R. Sherwood, formerly of Playford.

Trifolium grown alone is a very useful crop in the southern and south-eastern counties of England, especially on light and medium loams, provided they are not too lacking in lime. On the Tunstall light land, a good crop grew on parts of a field having a "lime requirement" of 12 cwt. of carbonate of lime, but in another part of the same field, having a "lime requirement" of 21 cwt. of carbonate of lime, it failed completely. If trifolium can be drilled on the stubbles immediately the corn crop is removed, preferably in August, and if there is sufficient moisture present, a very good crop may be ready for use during the last few days of the following May.

THE level of prices of agricultural produce in June fell by 4 points to 11 per cent. below 1911-13, and was 12 points below the level of a year ago. A decline in

The Agricultural Index Number prices was common to practically all kinds of produce included in the index, but those principally affected were potatoes,

pigs, cattle, butter and wool.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1927 :—

Month	Percentage increase compared with the average of the corresponding month in 1911-13.					
	1927	1928	1929	1930	1931	1932
January	49	45	45	48	30	22
February	45	43	44	44	26	17
March	43	45	43	39	23	13
April	43	51	46	37	23	17
May	42	54	44	34	22	15
June	41	53	40	31	23	11
July	42	45	41	34	21	—
August..	42	44	52	35	21	—
September	43	44	52	42	20	—
October	40	39	42	29	13	—
November	37	41	44	29	12	—
December	38	40	43	26	17	—

Grain.—There was very little alteration in prices of home-grown grain during June. The averages for wheat and oats were 3*d.* and 1*d.* higher at 6*s.* 4*d.* and 8*s.* per cwt. respectively, while barley was 3*d.* lower at 6*s.* 11*d.* The relative index numbers for barley and oats remained unaltered on the month at 7 per cent. below and 7 per cent. above pre-war, but wheat was 3 points higher at 20 per cent. below.

Live Stock.—All classes of live stock sold at lower prices in June, but while in most instances this was in accordance with the normal trend at this season of the year, the decline was very marked in the case of pigs. The indices for both fat and dairy cattle fell by 2 points, but there was no alteration in the index for store cattle. Fat sheep were $\frac{1}{4}$ *d.* per lb. cheaper, but the index was unaltered at 7 per cent. above 1911-13, while store sheep, although cheaper, did not fall so sharply as in the corresponding period of the base years and the index rose by 9 points. Both fat and store pigs, however, were greatly reduced in price, the indices being from 12 to 15 points lower on the month.

Dairy and Poultry Produce.—Milk was unaltered on average at 37 per cent. above pre-war. Butter was appreciably cheaper

and declined to 4 per cent. below 1911-13, but cheese was dearer at 53 per cent. above. Eggs also showed an increase in price and index, while poultry was cheaper.

Other commodities.—Old potatoes averaged approximately 20s. per ton less than in May, but were still over twice as dear as in 1911-13. Both clover and meadow hay were a little cheaper on the month and the index dropped a further point to 31 per cent. below the base years. A severe fall occurred in wool prices and values were as low as 43 per cent. below pre-war, or about 15 per cent. lower than in May and a similar amount below the level of a year ago.

Index numbers of different commodities during recent months and in June, 1930 and 1931, are shown below :—

*Percentage Increase as compared with the Average
Prices ruling in the corresponding months of
1911-13*

Commodity	1930	1931	1932			
	June	June	Mar.	Apr.	May	June
Wheat	7	-24*	-19*	-21*	-23*	-20*
Barley	-4*	-9*	4	1	-7*	-7*
Oats	-16*	-10*	5	5	7	7
Fat cattle ..	27	23	21	18	20	18
„ sheep ..	66	45	Nil	3	7	7
Bacon pigs..	46	11	-3*	Nil	3	-9*
Pork „ ..	52	20	9	9	6	-9*
Dairy cows ..	29	23	20	19	18	16
Store cattle ..	28	28	21	15	15	15
„ sheep ..	65	45	-9*	-11*	-11*	-2*
„ pigs ..	101	41	5	4	Nil	-15*
Eggs	29	2	4	7	-3*	2
Poultry	57	52	23	27	36	32
Milk	55	48	17	50	37	37
Butter	24	7	7	11	8	-4*
Cheese	42	25	38	39	43	53
Potatoes ..	-40*	100	164	139	145	113
Hay	25	-11*	-30*	-32*	-30*	-31*
Wool	-1*	-32*	-24*	-31*	-33*	-43*

*Decrease.

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THE National Institute of Agricultural Botany extends an invitation to farmers, potato growers and merchants, and agricultural advisory and administrative

Ormskirk Potato Trials, 1932 officers to visit the Potato Testing Station, Ormskirk, singly or in parties on August

11, 1932, or, if this date is inconvenient, on any weekday between August 8 and 20. Besides the usual trials of new varieties of potatoes for immunity from

wart disease the Institute is continuing for the Ministry of Agriculture and Fisheries field investigations of virus disease, and of the possibility of growing in England seed potatoes free from virus diseases. These trials will be open to the inspection of visitors. In addition visitors will be able to see the Lord Derby Gold Medal Trials, of which there are three this year, the Yield and Maturity Trials of the leading potatoes and the most promising of the latest introductions. Some of these trials are designed to show the influence of origin of seed on the behaviour of varieties. There is also a large number of demonstration plots of British and foreign varieties of potatoes, including those certified as immune in 1930 and 1931, and an interesting series of plots of some common potato synonyms.

Secretaries of branches of the National Farmers' Union and others who wish to organize parties to see the trials should write to the Superintendent of Potato Trials, Potato Testing Station, Lathom, Ormskirk, Lancs, suggesting alternative dates. Individual visitors will be equally welcome, but they too should inform the Superintendent of the date of their visit not less than a week in advance. Ormskirk is conveniently reached by a frequent service of local trains from either Liverpool or Preston.

* * * * *

THE Department of Scientific and Industrial Research invites tenders for the supply of 140 tons of Bramley's Seedling apples in minimum quantities of 15 tons, to be gathered and delivered to the **Bramley's Seedling Apples** Ditton Laboratory, East Malling, near Maidstone, Kent, at times to be arranged. **Wanted** Fruit must be of a minimum size of 2½ in. and free from bruising and other blemish likely to affect its keeping qualities. Orchard boxes will be supplied by the Department. Tenders must reach the Superintendent, Ditton Laboratory, not later than September 1, 1932.

* * * * *

ARRANGEMENTS are now complete for holding the ninth annual Poultry Conference at the Midland Agricultural College, Sutton Bonington, Loughborough, on **Midland College** Tuesday, September 20, 1932, commencing **Poultry Conference** at 10.45 a.m., when the chair will be taken by Sir Edward Brown, LL.D., F.L.S. As on previous occasions four papers will be read, the speakers and subjects this year being as follows: Dr. Charles Crowther, "The Place of Laying Trials in the Development of the Poultry

Industry"; Mr. C. S. Fermor, "Table Poultry Production"; Professor D. C. Matheson, F.R.C.V.S., "Studies in Some Diseases of the Fowl"; and Dr. Ethel Cruickshank, "Recent Work in Nutrition." Copies of the programme, giving full particulars as to accommodation for visitors, refreshments, &c., are obtainable on application to the Principal, Dr. Thos. Milburn, at the above address.

* * * * *

Redemption of Tithe Rentcharge.—The Minister of Agriculture and Fisheries announces that, for the purpose of redemption of tithe rentcharge for which application is made after July 8, 1932, until further notice, the compensation for redemption will be twenty-seven times the net amount of the tithe rentcharge after the deductions prescribed by the Tithe Acts, 1918 to 1925, have been made.

* * * * *

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W.1, on Monday, June 20, 1932. The Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders:—

Norfolk.—(1) An Order continuing the operation of the existing minimum and overtime rates of wages from June 26, 1932, until December 31, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30s. per week of 53 hours in summer, 40 hours in the week in which Boxing Day falls and 48 hours in any other week in winter, with in addition in the case of teamsmen, cowmen, shepherds and yardsmen, 5s. 6d. per week, and in the case of sheep-tenders and bullock-tenders, 4s. 6d. per week to cover employment in connexion with the care of horses and stock. Workers of the special classes named are also entitled to an additional sum in respect of any employment on those duties on Boxing Day, except where a day's holiday on full pay is given in lieu. The overtime rates in the case of male workers of 21 years of age and over are 9d. per hour on weekdays and 11d. per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

(2) An Order fixing special minimum and overtime rates of wages for male workers employed on the corn harvest in 1932. In the case of workers of 21 years of age and over employed throughout the harvest, the wage payable in respect of the harvest is an inclusive sum of £11. In the case of workers who are not employed for the full harvest period, special differential rates have been fixed for overtime employment on the corn harvest, the rate in the case of workers of 21 years of age and over being 9½d. per hour.

Oxfordshire.—An Order continuing the operation of the existing minimum and overtime rates of wages from June 26, 1932, until September 24, 1932. The minimum rate in the case of male workers of 21 years of age and over is 28s. per week of 50 hours with overtime at 8d. per hour on weekdays and 10d. per hour on Sundays. In the case of female workers of 18 years of age and

over the minimum rate is 6d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

Enforcement of Minimum Rates of Wages.—During the month ending July 14 legal proceedings were instituted against seven employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County.	Court.	Fines imposed.			Costs allowed.			Arrears of wages ordered.			No. of workers involved.
		£	s.	d.	£	s.	d.	£	s.	d.	
Devon	South Molton	0	5	0	1	9	0	1	0	0	1
Hampshire ..	Lymington	1	0	0	—	—	—	29	16	6	1
Nottingham	Mansfield ..	2	0	0	—	—	—	14	8	5	2
Stafford ..	Newcastle	7	0	0	5	9	0	22	16	8	3
Wiltshire ..	Malmesbury	20	0	0	—	—	—	8	19	4	2
Yorks, N.R.	Scarborough	1	0	0	—	—	—	9	13	7	1
Yorks, W.R.	Thorne ..	*	—	—	—	—	—	—	—	—	1
		£31 5 0			£6 18 0			£86 14 6			11

*Case dismissed.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS

ENGLAND

Northants : The post of Agricultural Assistant, formerly held by Mr. R. O. Wood, B.Sc., will not be continued.

WALES

Denbigh : Mr. A. E. Cope, N.D.P., has been appointed Instructor in Poultry-Keeping.

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NOTICES OF BOOKS

Growth and the Development of Mutton Qualities in the Sheep.

A Survey of the Problems involved in Meat Production. By John Hammond, with a section in conjunction with A. B. Appleton. Pp. xxv + 597; 10 appendixes; 139 tables; 71 diagrams; 137 photographic and 4 text illus. (Edinburgh: Oliver & Boyd. 1932. Price 42s.)

Mr. Hammond, using his own experimental work with the Cambridge University flock of Suffolk sheep as the skeleton, has provided the research worker in animal husbandry with an admirable review of the whole subject of mutton production. The first part deals with matters that directly affect the breeder, and is concerned with the rate of growth as measured by live weight, for Mr. Hammond believes that "by determining the direction and extent of environmental variability in weight and composition, one will be in a better position to judge the true genetic value of any animal." Variations due to different years, sex, whether the animals are singles, twins or triplets, time of lambing, effect of shelter and accidents are all discussed, as well as the effect of the sire as compared with the dam, and the influence of feeding, which includes the difference between forage

crops and concentrated food. In an appendix are given, in some detail, the figures on which the conclusions are based. These provide a norm of the flock at different ages and should prove invaluable to future investigators.

The second part introduces the butcher, who is concerned not so much with the general rate of increase as with the composition of this increase, since to him the value of the animal depends on what part of the body has increased in weight. This part of the book is divided into two sections, the first dealing with the causes of variation in carcass percentage, particularly the contents of the alimentary canal, effect of age, fatness, breed and sex. The second section covers the relative development of the different organs. These are discussed in relation to live weight, to the growth of the heart and to age.

The flesh of certain parts of the carcass is of more value to the butcher than the flesh of other parts. To measure the flesh on these parts is difficult, but Mr. Hammond, having previously found that muscular growth followed and was dependent on bone growth, has to a great extent overcome this obstacle by studying the development of the skeleton. Thus the third part of the book deals with the relative weights of different parts of the skeleton, firstly as affected by age, next by sex in relation to age, and then by breed. The author points out, interestingly, the effect of domestication upon the proportions of the individual skeleton. He treats the principal bones individually.

The fourth section introduces the housewife, who wants to buy her meat with the minimum of bone attached. The proportion of meat to bone varies with age. Knowledge of this in relation to the increase in live weight and to the carcass percentage provides the author with a pretty good estimate of the edible meat produced at the different ages. Adding to this the knowledge of the food consumed per pound of live-weight increase, the question of economy of live-weight gain is introduced and, with it, the reintroduction of the farmer, thus making the circle complete.

The last part (written with the assistance of Dr. A. B. Appleton) is in itself a book. It deals with the development of the various tissues of the leg of mutton, the growth changes of the bones, the various groups of muscles, the relation of bone to muscle weight; and the relative development of the individual muscles are each dealt with in relation to age, sex, breed, domestication and state of fatness. Then follows a chapter on the chemical composition of muscles and another on the distribution of fat. The histology of the muscles is discussed in a special chapter, and it would be well if all concerned with experimental work on meat production would ponder over this at some length.

Although the title of the book indicates that the sheep is the principal subject, Mr. Hammond has not confined himself to mutton alone, but has touched upon meat production in other animals, and much may be learned, particularly of beef production. On the whole the work is one of reference rather than a book to be read straight through. It covers a wide field and breaks fresh ground.

In parts the author's particular viewpoint is forcibly presented. In this Mr. Hammond is justified, for by certain of his statements he will certainly stimulate interest and investigation. Without such colour, books of this nature tend to make dull reading; but in this one, however much, on certain points, some readers may differ from the author, they will turn each page with zest and may even modify their own ideas, for, on the whole, the presentation is fair to all concerned. The book will take a worthy place in the literature of applied physiology, where it should find a position close to that other book from Cambridge,

to which all animal investigators are indebted, namely, *The Physiology of Reproduction*, by Dr. F. H. A. Marshall.

The Growth of Population and Agriculture (*Bevölkerungsgang Und Landwirtschaft*). By N. Jasny. Bulletin of the Institute for Agricultural Market Research, Berlin. No. 2, pp. 88. Price RM. 2.80.

The author of this publication has an international reputation in the realm of cereal marketing research, and this volume will be received with respect by those who are acquainted with his previous work. Various writers have pointed out that one of the most important causes of the international crisis in agriculture is that the increase in production per unit of area and per unit of man power has increased more rapidly than the rate of increase in the consuming population. Jasny has collected the available statistics which go to prove this assumption. Before the War, agricultural production was rapidly being developed in order to meet steadily increasing demands for its products, part of which was due to increased consumption per head, but the more important proportion of which was due to the rapid rate of increase in the number of consumers. Since the War, however, a complete change in the rate of growth of population has taken place. Many of the civilized countries now show a slower rate of increase, and probably will be confronted in the near future with a stationary population. Later still they may find that the numbers of their people are decreasing. This change is likely to have a very marked effect upon agriculture throughout the world. The demand for cheap food-stuffs—bread, potatoes, legumes, and cheap vegetables—will increase. Against this Jasny thinks that there will be an increased demand for a few of the best class of animal products, and especially for the finer fruit and improved vegetables. The total demand for agricultural produce will, however, be unable to increase at the rate of this luxury demand. The supply of labourers will steadily decline on account of the change in the rate of population growth, and as a consequence there will arise a demand for higher rates of wages, and this will stimulate the already rapidly developing processes of rationalization and mechanization. The larger holdings will find the most difficulty arising out of the decrease in labour supply, but small farmers will feel its disadvantages. The diminishing demand for produce will also at a later stage result in a decline in land values and rents.

Pistol v. Pole Axe : A Handbook on Humane Slaughter. By L. Macnaghten. Intro. by Viscount Lee of Fareham. Pref. by Professor R. G. Linton, Ph.D., M.R.C.V.S.. Pp. xxv+577, 94 illustrations. (London: Chapman & Hall, Ltd. 1932. Price One Guinea.)

The author of this volume expresses the view that all animals should be stunned before they are bled, and makes no exception even in the case of the Jewish method of slaughter. In her opinion, the stunning should be by a mechanically-operated instrument and not by pole axe, because of the greater precision of the former. Mechanically-operated instruments are illustrated and described in some detail in a chapter entitled "Humane Killers," and they include those operating a "captive" bolt and those firing a free bullet.

The author's attitude towards stunning by electricity appears to be unfortunate. She says: "Stunning by electricity is hardly mentioned in this book. My own view is that we already have safe, simple, economical and perfectly humane killers for all requirements. Why trouble about another method the action of which has the reputation of being most uncertain?"

This entirely ignores the very serious objection to the use of bullet-firing or captive-bolt instruments for pigs on account of the "splashing" of the carcass, which many traders are convinced results from their use. Excellent results have been reported by the use of an electrical stunning instrument on pigs, and it has now been adopted at several large slaughtering centres in this country because it does not produce "splashing" and is quite as safe, simple, economical and humane as the pistol. By ignoring the value of such instruments the author appears to do harm to her cause.

The book discusses other aspects of humane slaughter besides the question of stunning, and deals with methods of restraint, casting, etc. Chapters are also included dealing with Acts of Parliament and by-laws on the subject of the slaughter of animals.

The work would gain by drastic cutting, as at present it contains copious and frequently repeated quotations of opinions by all and sundry in support of statements that seem to need little support. Viscount Lee of Fareham refers to this in the foreword when he says: "If I have a fault to find with her book, it is that her modesty and her anxiety to cite chapter and verse in support of her every statement have overloaded her pages with a wealth of corroborative evidence which makes it sometimes a little difficult to see the wood for the trees."

Insect and Related Pests of Agriculture (*Die Tierischen Schädlinge des Ackerbaues*). By S. Rostrup and M. Thomsen. Translated into German from the Danish by H. Bremer and R. Langenbuch. Pp. xi+367, 231 illustrations. (Berlin: Paul Parey, 28 and 29, Hedemannstrasse, S.W.11. 1931. Price RM. 18.)

This book is a German translation of the fourth edition of a well-known Danish text-book on the animal pests of farm crops. Originally published in 1900, it has been entirely revised and brought up-to-date by the authors, while certain additional matter, dealing with pests that do not occur in Denmark, has been added by the translators. The arrangement is straightforward, the method adopted being to deal with the pests according to the groups or orders to which they belong. Besides insects, to which naturally the major part of the text is devoted, injurious nematodes, molluscs, millepedes, mites and other invertebrates find a place, but bird and mammal pests are not included. Each pest is briefly described, and a short account of its biology and a description of the control methods that are employed against it are given. Clear illustrations showing the pests and the damage caused by them are given in most instances.

In the introduction there is a useful summary of the various control measures adopted against farm pests, with descriptions of the insecticides in common use, while, following the main text, is a key for the identification of the various pests from the appearance of damage done. A short bibliography of books and papers on the subject is also appended. The volume forms a valuable text-book that will no doubt prove useful to agricultural entomologists in this country, where the majority of the pests described are also prevalent.

Market Milk. By E. Kelly and C. E. Clement. Pp. xxii+489. Second edition, re-written. (London: Chapman & Hall, Ltd. New York: Wiley. 1931. Price 27s.)

Although essentially concerned with conditions in the United States, this book contains much information that will be of interest to students and others employed in the milk industry in this country. The work is conveniently divided into some twenty sections, each complete in itself; and this arrangement makes reference to any particular topic both rapid and easy. It shows a clear insight into the intricacies of an

industry where the quality of the product may be affected by so many adverse factors; but it is a little strange that, in the comprehensive chapter on Methods of Clean Milk Production, there is no mention of rejecting the first-drawn milk, a practice insisted upon by most of the dairy instructors in Great Britain. The notes on the score card, in the section on Dairy Farm Inspection, may, however, be read with profit by all those engaged in fostering the production of milk of high quality in this country.

Since the book was first published in 1923, much progress has been made in the solution of problems bearing on the transportation of milk, and this part of the work has been very thoroughly revised. A valuable chapter has been added on Country Receiving Depots, giving full consideration to the construction and successful operation of the plant required. The chapter on "The City Milk Plant" is also most instructive, although, in view of the available information on the detrimental effect on raw milk of repeated pumping, it is surprising to find (by reference to Table 66, p. 241) that, in upwards of 40 per cent. of the American city milk plants, this undesirable feature is triplicated.

The excellence of the type, the numerous illustrations and the very complete bibliography of relative literature at the end of each chapter add greatly to the value of the work. It would be useful if some British technologist were to compile an equally instructive volume dealing with the problems of our own milk industry.

Getreidekrankheiten. By Dr. O. Appel. (Berlin: Paul Parey, 28 & 29 Hedemannstrasse, S.W.11. 1931. Price RM 5.)

This little book is No. 10 of the well-known series of Pocket Atlases issued by Messrs. Paul Parey for the use of German agriculturists. The title is not a complete indication of its contents for, in addition to what are usually understood as the *diseases* of our cereal crops (including maize), it deals with the insect and other animal pests that commonly attack them, as well as with damage caused by hail and frost. There are twenty-four plates of bold, coloured illustrations drawn by A. Dressel, and opposite each is a clear and succinct account of the subjects illustrated, with brief notes on methods of control. Most of the diseases and pests described occur in Great Britain, and farmers and others in this country who are familiar with the German language will find the book a very handy compendium of the subjects of which it treats.

An Introduction to the Scientific Study of the Soil. By N. M. Comber, D.Sc., A.R.C.S., F.I.C. 2nd ed. Pp. 208; 23 figs. (London: Edward Arnold & Co. Price 7s. 6d.)

This book is intended primarily as a manual for agricultural students, but it should prove useful also to general agriculturists, chemists, horticulturists, ecologists and others who require a concise and reliable outline of existing knowledge on soils. Although the first edition appeared as recently as 1927, considerable revision has been found necessary owing to the rapid developments that have taken place in soil science during the intervening five years. More space is now devoted to soil microbiology, while the section dealing with mechanical analysis has been rewritten in the light of the latest research, and in other respects the book has been brought up to date. There is a selected bibliography of papers, etc., to which those who wish to study the subject further may refer.

Agricultural Progress. Vol. IX, 1932. Pp. 183. (Cambridge: W. Heffer & Sons, Ltd. Price 5s.)

The current volume of this journal opens with a symposium on "Recent Progress in Grassland Research" consisting of papers by

Dr. H. E. Woodman, Dr. R. A. Roberts, Mr. W. Godden, Mr. F. R. Horne, Prof. R. G. Stapledon and Prof. J. A. Hanley. These are followed by sections on Agronomy, Animal Husbandry, Dairying, Education, Engineering and Poultry, each containing articles by writers who are in touch with the latest developments in their respective subjects. The number closes with notes, reviews of books and a record of recent activities of the Agricultural Education Association, of which this publication is the official organ.

The Standardization of Cereals (*Die Standardisierung von Getreide*).

By N. Jasny. Pp. 151. (Berlin: Institut für Landwirtschaftliche Marktforschung, N. 4, Invalidenstrasse 42. 1932. Price RM. 5-80.)

This brochure deals with the grading of cereals as practised in Germany, Russia, Canada and the United States of America. The first part describes the methods of division into classes and grades employed in the various countries, while the second details the administrative and technical measures adopted for putting these methods into practice. General problems of grain standardization are also discussed. The text throughout is assisted by numerous tables and diagrams.

Gold from Your Garden. By B. L. Godfrey, F.R.H.S. Pp. 56. (London: Arts and Crafts Publishing Co., Ltd. Price 1s.)

This pleasant little brochure aims at impressing the average man with the advantages of intensive production for the smallholder. There are sections on cucumbers, melons, mushrooms, intercropping, easy crops and flowers to force, and home-made jam, based on practical experience and written in an optimistic vein that cannot fail to inspire some readers to "go and do likewise."

Journal of the Yorkshire Agricultural Society, 1932. Pp. 186. (York: Yorkshire Agricultural Society, New Street Chambers. Price 5s.)

This annual volume contains a record of the work of the Society during the past twelve months, together with the rules and privileges of membership, lists of officers and members, and useful statistical information. In addition there are a number of contributions of interest to agriculturists both within and without the borders of our largest shire. Among these we notice an article by Mr. A. W. Street on the "Trend of Marketing Progress," and one by Mr. W. Lawson on "Milk and Milk Products." Professor J. A. S. Watson writes on "Cattle Breeding," Mr. J. Cruickshank on "Silage," Mr. R. McG. Carslaw on "Readjusting Farm Organization," Mr. H. N. Bathgate on agriculture as "The Key Industry," and Mr. F. R. Huxtable on "Our Colossal Food Imports." Mr. J. Fairfax-Blakeborough contributes an interesting study on the "Internal Economy of Yorkshire Farms 50 Years Ago," and Dr. W. E. Collinge of the Yorkshire Museum a formidable list of "Agricultural Pests and Plant Diseases Observed in Yorkshire during 1931." These features combine to make a useful and practical manual for the farmer.

Mechanization and British Agriculture. Rothamsted Conferences, XIV. Pp. 55. (Harpenden: Rothamsted Experimental Station. 1932. Price 2s. 6d.)

Since a definitive account of the Rothamsted Conference on Power Farming appeared in the March issue of this JOURNAL, it is, perhaps, unnecessary to examine this publication in detail now. The Conference was held under the chairmanship of the Earl of Radnor, and papers were read by Sir John Russell on "The Maintenance of Soil Fertility under Mechanized Farming Systems," by J. E. Newman

on "Engineering Developments and Possibilities," and by Professor J. A. S. Watson on "The Combination of Livestock with Systems of Mechanized Farming." These papers are reprinted in full, together with the consequent discussions, and a "Summary of the Agricultural Problems Involved" by H. G. Miller. The publication serves to give permanent form to the material presented to the Conference, and makes it available to a wider public than could, in the nature of things, attend such a Conference.

The British Goat Society's Year Book for 1932. Pp. 210. 52 illustrations. (Compiled and issued by the Secretary, H. E. Jeffrey, Roydon Road, Diss, Norfolk. Price 1s. 6d.)

The current issue of this annual is larger than any of its predecessors and well maintains their high standard in regard to the quality of its contents. Among the wide range of subjects discussed, prominence is given to food products such as milk, butter, cheese and chevon or goats' flesh. There are several articles on breeding, nutrition, diseases, goats' milk from a medical and hygienic point of view, and statistics of milk yields that may be a revelation to some readers. Dr. A. Azzopardi gives an interesting account of the famous "Maltese Goat," Dr. J. B. Oesch writes on the "Swiss Breeds" from which our best blood is descended, and Mr. A. D. Buchanan Smith on "'Wild' Goats in Scotland," while Mr. J. A. Caseby contributes some "Simple Hints on Goat-keeping" derived from his own long experience. The possibilities of the goat as a milk producer are indicated by the official record of §§§ Champion Springfield Precocity Q*Q* (British) which has yielded 5,050 lb. 15 oz. in one lactation.

Farm Tractors. By A. A. Stone. Pp. vii+492. Illus. (London: Chapman & Hall, Ltd. New York: John Wiley & Sons, Inc. 1932. Price 23s.)

The number of recently-issued publications relating to farm tractors affords an indication of the rapid spread of the mechanization of agriculture. The market for farm tractors is naturally much larger in America than in this country, owing to the vast area of its agricultural land, and the majority of the books dealing with the design, use, maintenance and repair of these machines emanate from that country. This volume covers much the same ground as others on the same subject. It opens with a description of the various types of farm tractors available, describes fully the technique and theory underlying their design, and gives instructions for working the machines in connexion with the numerous operations on which they can usefully be employed. Perhaps the most valuable part of the work from the point of view of the farmer is the large section that deals with repairs, and contains detailed information as to methods of disassembling, repair and reassembling.

Britain's Trade and Agriculture: Their Recent Evolution and Future Development. By Montague Fordham. Pp. 224. (London: George Allen & Unwin, Ltd. 1932. Price 7s. 6d.)

Plans for the revival of agriculture are by no means infrequent and few of them advance practical views. Mr. Fordham holds that neither trade nor agriculture can be stimulated without some consideration of their interdependence, and he has taken up the lance of Don Quixote in order to tilt at some of our favourite windmills. These, in the form of clichés, crystallized ideas and slogans, he has successfully demolished in theory.

In a diversity of countries, efforts are being made both by writers and administrators to advance theories or to put into practice policies

that have the object of creating national well-being by stimulating the production of as large a part of a nation's requirements as possible within its own territory. Mr. Fordham has a strong feeling in favour of this movement and he has given his blessing, not specifically to what is being done in this country, but to plans having a similar basis.

The work of demolishing existing theories and ideas is well and truly done, and Mr. Fordham's easy and fluent style renders his book a pleasure to read. This is so true that it is difficult to quarrel with his conclusions. Whether, however, his theories will ever find their way completely into the realm of practical politics is another matter. No doubt those that crystallize many of the tendencies of modern thought may do so. It is unfortunate that it should be necessary to abandon the ideal theory of an international policy for world reconstruction in favour of an attempt to create prosperity and its consequent happiness and content within the narrow ambit of a closely-defined nationalism, but even within the limits of a nation the father of a family will care for that family before his unrelated fellow-countrymen. Nations can perhaps do no more. Mr. Fordham's book will enable us to appreciate this necessity and it deserves to be read.

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SELECTED CONTENTS OF PERIODICALS

Plant Pests and Diseases

Further Observations on the Habits of the Raspberry Beetle (*Byturus tomentosus* Fabr.) with special reference to the Control of the Pest by means of Derris. *W. Steer.* (Jour. Pom. and Hort. Sci., x, 1 (March, 1932), pp. 1-18.) [63.27; 63.295.]

The Loss of Toxicity of Pyrethrum Dusts on Exposure to Air and Light. *F. Tattersfield.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 396-417.) [63.295.]

The Evaluation of Sulphur Suspensions used in Spraying. *R. M. Woodman.* (Jour. Soc. Chem. Ind. (Trans. and Comm.), 51, 14 (April 1, 1932), pp. 103r-107r.) [63.295.]

Studies on the Reaction of Disease Organisms to Light. III. The Reaction of Disease Organisms to Certain Wavelengths in the Visible and Invisible Spectrum. *W. A. R. Dillon Weston.* (Sci. Agric., xii, 6 (Feb., 1932), pp. 352-356.) [63.295.]

Live Stock and Feeding

Wiltshire Sheep Breeding Trials. *A. Hurd.* (Jour. Bath and West and S. Counties Soc., Sixth Ser., vi (1931-1932), pp. 71-74.) [63.631.]

A Survey of Sheep Farming Systems. *J. F. H. Thomas.* (Jour. Bath and West and S. Counties Soc., Sixth Ser., vi (1931-1932), pp. 67-70. [63.631.]

Recent Modifications in Folding Practice. *J. F. H. Thomas.* (Agric. Prog. ix, (1932), pp. 76-78.) [63.631.]

The Organisation and Expansion of the Pig Industry. *Earl of Radnor.* (Jour. Farmers' Club, 1932, Part 2 (April), pp. 59-82.) [63.64.]

Pig Keeping in Scandinavia. *W. T. Price.* (Agric. Prog., ix (1932), pp. 78-84.) [63.64.]

The Determination of the Surface Area of Swine and Other Animals. *T. Deighton.* (Jour. Agric. Sci., xxii, 2 (April, 1932), pp. 418-449, pl. i and ii.) [389; 612.394.]

Composition and Fodder Value of Grass Silage. *J. N. Whittet.* (Agric. Gaz., New South Wales, xliii, 3 (March, 1932), pp. 167-173.) [63.19832; 63.60433.]

- The Nutritive Value of Grass and Some of its By-products. *S. J. Watson*. (Agric. Prog. ix (1932), pp. 62-64.) [63.60433.]
 Salt for Stock. *W. Thomson*. (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 204-206.) [612.394 ; 63.60432.]

Poultry

- The Utilization of Milk and Milk By-products in Poultry Feeding. *R. T. Parkhurst*. (Agric. Prog., ix (1932), pp. 101-106.) [63.60432 ; 63.651 : 043.]
 Poultry Keeping in Scotland. (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 196-201.) [63.65 (41) ; 63.651.]
 The Effect of an Insufficient Supply of Vitamin D on the Growth of the Skeleton and Internal Organs of Chickens. *E. J. Sheehy* and *K. Sheil*. (Sci. Proc. Roy. Dublin Soc., xx, 16 (Jan., 1932), pp. 173-179.) [612.39 ; 63.651 : 043.]

Dairying

- Flavour in Milk : I. *R. H. Leitch*. (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 167-173.) [63.711 ; 63.719.]
 The Surplus Milk Problem. *J. Wyllie*. (Jour. Brit. Dairy Farmers' Assoc., XLIV (1932), pp. 14-26.) [63.71 ; 63.715.]
 The Problem of Low Fat Content in Morning's Milk. *H. T. Cranfield*. (Agric. Prog., ix (1932), pp. 98-100.) [63.712.]
 The Use of Score Cards. *H. G. Robinson*. (Agric. Prog., ix (1932), pp. 85-92.) [63.711.]
 Results of Seven Years' Study of Keeping Quality Tests. *H. Barkworth*. (Agric. Prog., ix (1932), pp. 93-95.) [63.712 ; 63.717.]
 The Effect of Season on the Reliability of the Percentage of Solids-not-fat in Milk, as Calculated by Formulæ. *S. Bartlett*, *J. Golding* and *A. Wagstaff*. (Agric. Prog., ix (1932), pp. 95-98.) [63.711 ; 63.712.]
 Influences of Heating and Agitating Milk before Separation on the Fat Loss in the Skim Milk. *J. Lyons* and *W. Finlay*. (Econ. Proc. Roy. Dublin Soc., II, 27 (Feb., 1932), pp. 423-443.) [63.717.]
 The Accuracy of Fat Determinations in Buttermilk, and the Effect thereon of the Presence of Lecithin. *J. Lyons* and *W. Finlay*. (Econ. Proc. Roy. Dub. Soc., II, 28 (Feb., 1932), pp. 445-459.) [63.715.]
 Lancashire Cream Slice. *J. Stubbs*. (Jour. Brit. Dairy Farmers' Assoc., XLIV (1932), pp. 59-61.) [63.736.]
 Faults in Cheddar Cheese and their Eradication. *J. G. Davis*. (Jour. Brit. Dairy Farmers' Assoc., XLIV (1932), pp. 46-58.) [63.736.]
 Dairying in Finland. *R. Stenhouse Williams* and *N. C. Wright*. (Jour. Brit. Dairy Farmers' Assoc., XLIV (1932), pp. 34-41.) [63.7 (471).]

Veterinary Science

- John's Disease. *G. W. Dunkin*. (Jour. Brit. Dairy Farmers' Assoc., XLIV (1932), pp. 27-33.) [619.2.]
 Liver Fluke and Stomach Worms in Sheep. *T. W. M. Cameron*. (Scottish Jour. Agric., xv, 2 (April, 1932), pp. 220-222.) [59.169 ; 619.3.]
 Diseases of Poultry and their Danger to the Larger Animals. *K. D. Downham*. (Jour. Brit. Dairy Farmers' Assoc., XLIV (1932), pp. 42-45.) [619.5.]

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NOTES FOR THE MONTH

HARVEST will be far advanced before this issue of the JOURNAL is published, but farmers may still be enabled to see harvester-threshers at work. The number of harvester-threshers in use on the larger farms in country districts this year is greater than ever before. Most farmers

The Harvester- Thresher

who are interested in mechanical improvements that economize cost will be anxious, if they have time in the stress of their own harvesting operations, to see how these big machines do their work. It is probably now only a question of time before most large corn-growing farms will find it essential to use one of these great labour-saving machines, which can be employed on average soils more or less regardless of the weather.

The districts where the machines can be seen at work this harvest, by the courtesy of the gentlemen named, are as follows :—

- Messrs. Alley Bros.' Estate, South Creake, Norfolk.
- Mr. A. F. de Ledesma, Popham, near Basingstoke, Hants.
- *Mr. R. Dudley, Linkenholt Manor, Linkenholt, Hants.
- Mr. R. Fisk, Kirmington, Lincs.
- The Flamsteadbury Estates, Redbourn, Herts.
- Mr. Haggis, near Louth, Lincs.
- Magdalen College, Oxford, farms in Berkshire.
- Mr. G. H. Nevile, Wellingore, Lincs.
- *Messrs. Parker & Proctor, Gayton, King's Lynn, Norfolk.
- Major Proby, Elton Hall, Peterborough.
- *The Viscount Traprain, Whittinghame, Haddington, Scotland.
- *Captain J. R. Warburton, Shillingford Farm, Shillingford, Oxon.
- *Messrs. E. Wombwell & Sons, The Rectory Farm, Fulbourne, Cambs.
- Major Wormald, Willerby Wold, East Yorks.

At the farms starred on the list above the harvester-threshers being used are of English make, and should prove specially interesting. Most of these farmers have informed the Ministry that they will be pleased to offer facilities for visitors to see the machines at work. Arrangements were made for a new straw baler, brought into the country by the Oxford University Institute of Agricultural Engineering, to be demonstrated first on Mr. Nevile's farm at Wellingore, after which it might be used at other centres.

It is now generally recognized that an essential accompanying equipment to a harvester-thresher is a grain drier, and no doubt all the farmers mentioned and any others who are using the harvester-thresher this year have taken care to equip themselves with an efficient make. Satisfactory designs are now on the market at an attractive price.

There are two methods of using the harvester-thresher, one known as the "direct combine" method, in which cutting and threshing are performed in one operation; and the other, known as the "windrow" method, which is used wherever the crop is thick and heavy and the harvesting conditions are not sufficiently favourable for direct combining. By the windrow method the weeds in the cut crop are given time to wilt and the crop to dry a little before threshing. The straw will then be of better quality and the losses in grain lower. A badly laid crop can be better dealt with by a combine than a binder.

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THE Additional Import Duties (No. 5) Order, 1932, dated August 8, 1932, made by the Treasury on the recommendation of the Import Duties Advisory Committee, impose duties, additional to the 10 per cent. *ad valorem* duty chargeable under the Import Duties Act, 1932, on the horticultural products mentioned below. The Order comes into force on September 1, 1932. As from this date also the existing duties imposed by the Minister of Agriculture under the Horticultural Products (Emergency Customs Duties) Act, 1931, are revoked by the Horticultural Products (Emergency Customs Duties) Revocation Order, 1932.

The following is a list of the new duties, and it should be understood that the duty shown in the third column of the table is inclusive of the general *ad valorem* duty of 10 per cent. chargeable under the Import Duties Act, 1932:—

Class or description of goods	Duration (The dates given are inclusive)	Amount of duty
<i>Fresh Fruit—</i>		
Cherries	May 1–August 15 ..	3d. per lb.
Currants	May 1–August 31 ..	2d. per lb.
Gooseberries	May 1–July 31 ..	½d. per lb.
Grapes (Hothouse) ..	The whole year ..	3d. per lb.
Plums	June 1–October 31 ..	9s. 4d. per cwt.
Raspberries and Loganberries	July 1–August 31 ..	2d. per lb.

Class or description of goods	Duration (The dates given are inclusive)	Amount of duty
Strawberries	April 1-July 31	3d. per lb.
Peaches and Nectarines (Hothouse)	April 1-October 31	1s. per lb.
<i>Fresh Vegetables—</i>		
Asparagus	January 1-June 30	4d. per lb.
Green Beans	January 1-August 31	1½d. per lb.
Broccoli and Cauli- flowers }	The whole year	3s. per cwt.
Carrots	The whole year	2s. 4d. per cwt.
Lettuce	January 1-April 30 {	8s. per cwt.
Endive	May 1-December 31 {	6s. per cwt.
Chicory (Salad)		
Cucumbers (other than gherkins)	March 1-November 30	8s. per cwt.
Mushrooms	The whole year	8d. per lb.
Green Peas (unshelled)	January 1-July 31	9s. 4d. per cwt.
" " (shelled) ..	January 1-July 31	37s. 4d. per cwt.
Turnips	The whole year	2s. 4d. per cwt.
Tomatoes	June 1-July 31	2d. per lb.
	August 1-October 31	1d. per lb.
<i>Flowers, etc.—</i>		
Foliage (excluding)		
Holly, Mistlotoe, As- paragus foliage and Golden Palm Branches)		
Cut Flowers in the following varieties :		
Lilac		
Gypsophila		
Heather		
Peonies		
Marguerites		
Marigolds		
Mimosa		
Narcissi (Polyanthus types)		
Star of Bethlehem		
Stocks	The whole year	
Violets		
Other Cut Flowers		
Plants in flower		
Flowers attached to Bulbs		9d. per lb.
Asparagus foliage		
Rose Trees		25s. per 100
Other plants and roots of flowering plants		6d. per lb.
Trees and Shrubs (ex- cluding Rose Trees, Fruit Trees, Azalea indica, and Sweet Bays)		Bare Roots : 20s. per cwt.
		Ballad Roots : 10s. per cwt.
Fruit Trees and Fruit Stocks		20s. per cwt.

It will be seen that, in addition to commodities which have been subject to duty under the Horticultural Products Act, the recommendations of the Import Duties Advisory Committee include raspberries and loganberries, peaches and nectarines (hothouse), and all nursery stock. Moreover, the amounts of duty, and the periods during which they will operate, vary in some respects from those imposed under the Horticultural Products Act. Owing to the somewhat restricted scope of this Act, the various duties were designed primarily to restrict the importation of foreign produce which "creamed" the British market before the home crops were available. Little protection was afforded to British growers during the period when their produce was being marketed in bulk. The scope of the Import Duties Act is less restricted and the primary object of the new duties is the adequate protection of the home grower during the period when his crops are being marketed in bulk, and the stimulation of home production, while, in respect of other periods, regard has been paid to revenue considerations. Thus, in respect of fresh fruits, the period of duty for cherries, currants, gooseberries and plums has been extended by periods varying from four to ten weeks, while the duty on strawberries will operate from April 1 to July 31 instead of terminating on June 25 as was the case this year. Some adjustment has been made in the amount of duty operating over these longer periods. The Committee considered that the objects of the duties could best be attained by fixing uniform duties to operate throughout the period, and in only two exceptions, viz., salad vegetables and tomatoes, have seasonal variations been recommended. The duty on grapes will be uniform at 3*d.* per lb. instead of 4*d.* and 2*d.* for different periods this year; the duty on plums will be 9*s.* 4*d.* per cwt. instead of 14*s.* per cwt., while strawberries will be subject to a duty of 3*d.* per lb. throughout the period.

The period of duty has been extended for nearly all vegetables, broccoli and cauliflowers, carrots, salad vegetables and turnips being in future subject to duty throughout the whole year. The duty on broccoli and cauliflowers will be uniform at 3*s.* per cwt. instead of 4*s.* and 3*s.* for different periods, and, while no change has been made in the duty on salad vegetables, that on carrots and turnips being reduced from 9*s.* 4*d.* to 2*s.* 4*d.* per cwt. The period for cucumbers and tomatoes has not been altered, but, as regards the former, the duty (from which gherkins will be

exempt) will be uniform at 8s. per cwt. as against 12s. and 8s. for different periods this year.

Under the Horticultural Products Act, the duties on flowers, etc., were made operative for the duration of the Act, i.e., until December 11, and the new duties will operate throughout the year. Nursery stock, fruit trees and fruit stocks, and plants and roots of flowering plants, are now subject to additional duties above the 10 per cent. *ad valorem* duty. Carnations and pinks and anemones will be subject to the duty of 9d. per lb. instead of 2d. per lb. as formerly, while lilac, gypsophila, and peonies have been transferred from the group dutiable at 9d. per lb. to that chargeable at 2d. per lb. Rose trees will be subject to a uniform duty throughout the year of 25s. per 100 instead of 30s. and 20s. for different periods.

The report of the Import Duties Advisory Committee submitting its recommendations to the Treasury, together with a copy of the Order, may be obtained, price 4d. net, on application to H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2.

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THE prominence given by leading English cattle feeders at the Welsh National Cattle Breeding Conference, held at Aberystwyth in the autumn of 1928, to

Better Stock : A the necessity for raising the standard of
Welsh Calf-Mark- Welsh store cattle in order to compete
ing Scheme successfully with store cattle from Ireland in the English market, has led to the adoption of practical measures by an Association of the Premium Bull Societies in the counties of Brecon, Radnor and Monmouth. Realizing the force of the opinions expressed at the Conference, a meeting of the members of the Breconshire premium bull societies was called in March, 1931, to formulate a scheme for the better marketing of calves sired by their premium bulls, and this meeting led to the linking up of the Breconshire Societies into an Association, its membership being confined to existing premium bull societies formed under the Ministry's Live Stock Scheme. The objects of the Association are :—

- (a) To ear-mark the progeny of premium bulls with the sign of the "Welsh Dragon," thereby providing buyers of store cattle so marked with a guarantee of their breeding.
- (b) To encourage store cattle rearers to breed from "Welsh Dragon" marked females, sired by approved tuberculin-tested premium bulls.
- (c) To encourage improvement in the methods of selling stock by organizing periodical sales of "Welsh Dragon" marked store cattle at convenient centres in the county.

- (d) To institute a campaign for giving publicity to the calf-marking scheme and for advertising "Welsh Dragon" marked stock in the feeding areas, and thereby to induce the grazier and feeder to buy direct from the store cattle rearers of the district.
- (e) To prepare for the inception of the Licensing of Bulls Act—members of the Association being enabled by means of the calf-marking scheme to furnish substantiated information regarding the breeding of non-pedigree bulls reared by them.

The interest taken in the scheme in Breconshire resulted in meetings being held in Radnor and Monmouth and in the formation of Associations in those counties. The three county bodies subsequently merged into one Association known as the "Brecon, Radnor and Monmouth Premium Bull Societies' Association," it being felt that such an amalgamation, by adding to the number of marked cattle available, would strengthen the movement and lead to a speedier attainment of the objects in view. There are in Brecon, Radnor and Monmouth nearly 80 premium bull societies in active operation, with a membership of 1,600 farmers, and about 5,000 calves are sired annually by the bulls placed out for the use of the societies.

Regulations governing the tattooing and registration of the calves were drawn up and official tattooers appointed. Owing to the necessity for conserving the Association's finances, the Milk Recording Society for the counties, on being approached, agreed to allow their tattooers to undertake the marking of calves for the Association at a charge of 1s. per calf, payable by the owner. The general expenses of the Association are met out of subscriptions of 10s. per annum, payable by each constituent premium bull society. The regulations provide that the ear-marking of the calves shall be carried out within two months of their birth. The marking is effected by means of the sign of the "Welsh Dragon" in the right ear, a letter to indicate the year of birth, and a number indicating the premium bull society concerned. By this means it will be possible to identify the sire of each calf.

The question of marketing has been under serious consideration by the Association. It is estimated that in the past store cattle from the district often changed hands three times or more before reaching their final destination in the feeding areas of the Midlands or Eastern Counties, and that the cost of unnecessary transport and drovers, together with the intermediary profits, account for a leakage of between two and three pounds sterling per head as between rearer and feeder. To remedy this, it is proposed to organize sales of "Welsh Dragon" marked cattle at convenient centres in each of the three counties, and the Association hopes that the grazier and feeder will attend and buy direct from the breeder at these sales.

The Association also hopes that the system of ear-marking by premium bull societies will be extended throughout Wales, so that the sign of the "Welsh Dragon" may be accepted as a recognized mark of good breeding. Considerable interest has been evinced in the scheme and 2,000 pamphlets have been distributed at the request of County Branches of the National Farmers' Union. Moreover, as evidence of the interest of stock rearers generally in the aims of the Association, it may be stated that applications are being received from non-members for the tattooing of their calves, but any extension of the scheme in this direction must await the special consideration of the Association.

The scheme is an interesting development of the Ministry's Live Stock Improvement Scheme, and its introduction was mainly due to the initiative of the Ministry's Live Stock Officer for the district concerned. It has come at an opportune time when it is more necessary than ever that home products should find their proper place in the home markets, and it is hoped that much good will result from the operation of the scheme.

* * * * *

THE Empire Marketing Board has recently issued two publications dealing with the statistics of dairy produce.

The first* embodies much of the data included in the Weekly Dairy Produce Statistics of Dairy Produce Notes issued by the Board, here brought together to form a useful résumé of supplies and prices of dairy produce in this country during 1931.

The United Kingdom is the most important market in the world for dairy produce. The total imports of butter in 1931 amounted to 8,071,000 cwt., which was nearly double the amount imported annually before the war, and 18 per cent. more than in 1930. Of this total, Denmark contributed 31 per cent., New Zealand, the most important Empire source, coming second with 24 per cent. The fall in prices that was such a marked feature in 1930 was checked in 1931, although the tendency remained for prices to weaken, and the average for the year was 13 to 14 per cent. below the 1930 level. It is estimated that consumption increased by about 14 per cent.

The total imports of cheese were slightly less than in 1930. Empire countries, principally New Zealand and Canada,

* *Dairy Produce Supplies in 1931.* E.M.B. 52. June, 1932. Obtainable through any bookseller, or from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. Price 1s., or post free, 1s. 3d.

supplied 2,524,000 cwt., or 87 per cent. of the total. Home production accounted for rather less than one-quarter of the total home supply. In spite of reduced imports, cheese prices, especially of Empire cheese, fell heavily during the year.

There was a big increase in the total imports of condensed milk, sweetened, separated or skimmed, and in milk powder, unsweetened, whereas the quantities of whole condensed milk, sweetened and unsweetened, increased but little. The chief source of supply for condensed milk is the Netherlands, and the bulk of the milk powder comes from New Zealand. Home production of condensed milk and milk powder appears to be increasing.

The total imports of eggs numbered 3,100,000,000, which was 2 per cent. lower than in 1930. The volume of Empire supplies was the largest ever recorded, and accounted for 24 per cent. of the total. Denmark is the chief source of supply and sent 29 per cent. of the total in 1931. Apart from the seasonal trend, prices were comparatively firm. National Mark eggs continued to command a premium over the highest grade of imported supplies.

Imports of bacon in 1931 were on an unprecedented scale, totalling 11,138,000 cwt., but only 3 per cent. of this came from Empire countries. This Report suggests that the peak of the European pig cycle was reached last year and that a fall in imports is not improbable. It also makes special mention of the German market for dairy produce, and of the effects of tariffs and quota systems upon the German trade.

The wealth of statistical detail contained in this Report makes it a valuable source of reference upon almost any aspect of the international trade in dairy products.

The other publication of the Board* is the first of a new series which will deal in turn with all the major agricultural products. Entitled *Dairy Produce: a Summary of Figures of Production and Trade Relating to Butter, Cheese, Preserved Milk, Eggs and Egg Products*, it sets out in very convenient form a mass of statistical information, of interest at any time, but of particular value at present when so much attention is being paid to international trade in agricultural produce, and to the possibilities of developing trade within the Empire. The next issues in this new series will deal with grain crops and meat.

* E.M.B./C/1. Obtainable through any bookseller, or from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. Price 6d., or post free, 7d.

THE Sixteenth Annual Poultry Conference was held at Harper Adams Agricultural College from August 9-12 inclusive, there being an excellent attendance. In a short session on Waterfowl problems, Miss V. Tallent, discussing

Harper Adams Poultry Conference "Pellets v. Mash for Table Duck Production," gave some interesting data

concerning an experiment in which pellets were used as the staple food for one group, the comparison group receiving mash. The ducklings were divided at one day old, were wing banded and weighed periodically throughout the experiment. Several groups of ducklings were tried on the rations which consisted of 15 parts bran, 35 parts middlings, 20 parts barley meal, 20 parts Sussex ground oats, 10 parts meat and bone meal and 2 per cent of cod liver oil. At six weeks of age the birds received a fattening mixture in pellet and mash form, composed of 40 parts middlings, 120 parts barley meal and 30 parts meat and bone meal. At the end of the fattening period the pellet-fed ducklings weighed 4.12 lb. and the mash-fed birds 5.1 lb. each. The cost of the pellets was 9s. 10½d. per cwt. and of the mash, 9s. 4½d. The feeding of the pellets took less time than mash-feeding, but the verdict was in favour of mash. Mr. A. N. Dickson brought out some excellent points in favour of ducks for egg production, which, with well bred stock, was above that of similarly bred pullets; but high food consumption and the low price for duck eggs reduced profits considerably. That there is profit in ducks is apparent, but so much depends on marketing facilities for eggs. A discussion on incubation and brooding of ducklings followed, the subjects being introduced by Mr. H. S. Godsmark and Captain F. S. Pordoe.

Marketing problems occupied the evening session, Mr. E. W. Sutherland dealing with "The Marketing of Eggs" and Mr. A. P. F. Grant with "The Marketing of Poultry." Mr. Sutherland emphasized the necessity of grading in accordance with the statutory grades. Mr. Grant, referring to the National Mark scheme, said that 14 packing stations had already been registered. Breeders were advised to study the requirements of the consumer and produce a white-shanked bird, which could be obtained by using a white-shanked breed, such as the Light Sussex, with a yellow-shanked breed, such as White Wyandottes or Rhode Island Reds.

Discussion groups again formed an attractive feature of

the Conference. The subjects discussed were : Table Poultry Experiments at Wye, Disease Problems, Management Problems, Grasses for Poultry Runs, Breeding Experiments and Egg Laying Trials.

Wednesday's session was devoted to nutritional and poultry feeding and turkey management. On the nutritional side Captain E. T. Halnan dealt with the "Nutritional Requirements of the Growing Chicken," and Mr. E. S. Sheehy with "Growth, Vitamin 'D' and Cod Liver Oil." Mr. I. W. Rhys, Senior Research Assistant at the N.P.I., gave an account of the use of "Wheat Meal in All-Mash Rations," this paper provoking a good deal of discussion. The speaker held that the total replacement of maize-meal by wheat-meal was not a commercial proposition, but that, when 40 per cent. was used, the results were quite satisfactory. The cost of either maize or wheat at the time of buying should have some influence on the matter.

Mr. Edmund Burr, who farms 300 acres of land in Norfolk, has for 10 years made a special study of turkeys and his paper on their management was a very practical exposition. He stated that, last year, he realized one pound profit per head on all turkeys reared. The cost of feeding each turkey averaged 10s. Early perching was encouraged and outdoor sleeping accommodation provided. Artificial incubation and brooding were practised, excellent results being obtained.

Thursday morning found Mr. J. Stephen Hicks discussing the pros and cons relating to "Table Poultry Production," in which he included some advice on the best breeds and crosses for the production of suitable chickens for various purposes. For general purposes, the Light Sussex male mated to large-sized White Wyandotte has given extraordinarily good quality chickens, 95 per cent. having white flesh. Mr. Hicks also favoured a system of breeding which would involve the use of three breeds, the object being to introduce male birds every season, such as Sussex one year, Faverolles the next and Game the third, using the female progeny from such matings for the purpose. In this way it was possible to keep up stamina and also breast meat qualities.

Among other papers read was an excellent one by Mr. W. F. S. Hindhaugh on "Some Observations on Fertility in White Wyandottes." He demonstrated that, in general, infertility in flocks of Wyandottes was due to individual birds and not to a poor performance of the whole. The poor performance of these individuals is constant throughout the breeding season.

REFERRING to the note in the July issue of this JOURNAL (p. 314), the Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland
Fertilizers and announce that, in pursuance of the powers
Feeding Stuffs : conferred on them by Section 23 of the
Revised Fertilizers and Feeding Stuffs Act, 1926,
Regulations they have now made new regulations
 entitled "The Fertilizers and Feeding
 Stuffs Regulations, 1932 (Statutory Rules and Orders, 1932,
 No. 658)," to replace the Fertilizers and Feeding Stuffs
 Regulations, 1928. The new Regulations came into oper-
 ation on September 1, 1932.

Copies of the new Regulations, which deal, amongst other
 matters, with methods of sampling and analysis, limits of
 variation, and alterations of the Schedules to the above-
 mentioned Act, can be obtained from His Majesty's Stationery
 Office, Adastral House, Kingway, W.C. 2, and branches,
 price 10d., post free 11d., or through any bookseller.

* * * * *

THE Twelfth Annual Imperial Fruit Show and Canners'
 Exhibition, at the Bingley Hall, Birmingham, October 21-29,
 will be the third visit of the Show to
Imperial Fruit Birmingham, previous Shows having been
Show and held there in 1924 and 1929.
Canners'

Exhibition Stands have been taken by leading
 firms in practically every section of the
 fruit and canning industries, including
 fruit merchants and salesmen, nurserymen, insecticide manu-
 facturers, horticultural machinery and sundries manufacturers,
 box makers, canners and canning machinery and factory
 equipment. The Show also has the support of the Empire
 Marketing Board, and the Departments of Agriculture for
 Great Britain, Northern Ireland, and the Dominions and
 Colonies. The Ministry of Agriculture will stage a large exhibit
 featuring the National Mark for fresh and canned fruits and
 for cider. Research exhibits will be provided by the Long
 Ashton Research Station, Bristol, and the Campden Research
 Station.

A comprehensive range of classes for Home and Empire
 fruit growers is included in the schedule, which can be obtained
 from the Secretary, 5 Bloomsbury Square, London, W.C. 1.
 Classes for English apples and pears include Cox's Orange
 Pippin, Worcester Pearmain, Allington Pippin, Ellison's
 Orange, Laxton's Superb, Bramley's Seedling, Newton Wonder,

Lane's Prince Albert, Comice and Conference, packed in standard market packages. A new departure is the inclusion of two classes for Cider apples. There are also classes for Honey, and for practically the whole range of fruits canned in the Dominions and the Home Country. Particulars of space available for trade exhibits can also be obtained from the address given above.

* * * * *

THE growing of fruit under modern conditions and for modern tastes requires the closest co-operation between research and practice. This is particularly true of the cultivation of fruit of the highest class for which there is a definite demand from a discriminating section of the public, and only by giving the closest attention to detail and by the intensification of production can this type of fruit be grown.

**Intensive Systems
of Apple
Production**

In recent years there have been marked developments in the production of apples by intensive methods—methods that have had as their chief object the growing of choice specimens of selected varieties—and the Ministry has now issued a Bulletin* reviewing the various practices in use in this country, namely, growing on cordons, small bushes and pyramids. In addition the publication gives a brief account of the experimental work that is being done in this connexion by the Research Stations.

One of many challenging passages in a recent article† that appeared in *Blackwood's Magazine* ran as follows :—

“ . . . the English apple is to the rest of the apple world what the grapes of Burgundy or the Champagne country, the oranges of Jaffa, or the coffee of Mocha are to the respective world nature of each product . . . ”

The writer goes on to emphasize that “ its excellence is by no means due to the hit-or-miss methods whereby we have hitherto cultivated it.”

If the glory of the English apple is not to fade then these hit-or-miss methods will have to be abandoned ; it will probably be by methods of culture such as are outlined in this Bulletin that its finest qualities will be maintained.

* Bulletin No. 49, *Intensive Systems of Apple Production*, obtainable through any bookseller or from H.M. Stationery Office, price 9d. (10d. post free).

† Forepoint Severn, *The Garden of the Hesperides*, Blackwood's Magazine, June, 1932. A delightful article devoted to the growing of the Cox Orange Pippin on cordons.

THE WHEAT ACT, 1932

THE object of the Wheat Act,* which became law on May 12, 1932, is to establish a standard price and a secure market for home-grown wheat of millable quality. The Act applies to the United Kingdom and the functions of "the Minister" (with one or two exceptions) are carried out by the Minister of Agriculture and Fisheries and the Secretaries of State concerned with agriculture in Scotland and Northern Ireland respectively, acting jointly. The administration of the scheme embodied in the Act is in the hands of the Wheat Commission, appointed by "the Minister," consisting of a chairman, a vice-chairman and seventeen members representing wheat growers, millers, importers, merchants, and consumers (including bakers). In most instances, before making an order under the Act, "the Minister" is required to consult with the Wheat Commission.

Flour millers and flour importers are required to make to the Wheat Commission a "quota payment" in respect of each hundredweight of flour delivered by them in the United Kingdom. The moneys thus obtained are paid into a Wheat Fund, and from this Fund growers who are registered with the Wheat Commission will receive, on the basis of their certified sales of millable wheat of their own growing, a "deficiency payment" representing approximately the amount by which the "standard price" exceeds the "ascertained average price" of such wheat. The "standard price" is 10s. a cwt., equivalent to 45s. a quarter of 504 lb., but it is subject to revision in 1935. The "ascertained average price" means the price per cwt. which the Minister of Agriculture and Fisheries determines to have been the average price (exclusive of any charge for transportation) obtained by registered growers during the cereal year for millable wheat of their own growing. "Cereal year" is the period August 1 to July 31.

"Millable wheat" is defined in Regulations† made by "the Minister" as follows:—

Millable wheat shall be wheat which is sweet and in fair merchantable condition, commercially clean as regards admixture and tailings, and commercially free from heated or mouldy grains or objectionable taint, and capable of being manufactured into a sound and sweet flour fit for human consumption having regard to the customary methods employed in the milling industry for cleaning and conditioning wheat.

* Copies of The Wheat Act, 1932, can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 6d., post free 7d.

† The Wheat (Definition of Millable Wheat) Regulations, 1932.

The Act does not interfere with a grower's freedom to sell his wheat to whom he pleases and at what price he can get. As the deficiency payment represents approximately the difference between the standard price and the *average* price of home-grown millable wheat, it follows that a registered grower who obtains more than the average price for his millable wheat will reap the benefit of the higher price he receives. The Act does not apply to wheat harvested before 1932.

The following paragraphs explain the scheme in greater detail.

The Anticipated Supply of Home-Grown Millable Wheat.—

At the commencement of each cereal year, the Minister of Agriculture and Fisheries is required to prescribe the quantity of millable wheat of their own growing which he anticipates will be sold by registered growers in that year—the “anticipated supply”—and in making this estimate he has to assume that $7\frac{1}{2}$ per cent. of the millable wheat available in that year will be retained for seed and not sold. The estimate may be varied at any time up to January 31 in any cereal year. The maximum quantity which can be taken in any year as the anticipated supply is 27,000,000 cwt. and the effect of this provision is to place a limit on the amount that can be paid out of the Wheat Fund.

The Quota Payment.—The quota payment is fixed at or near the beginning of the cereal year by order of the Minister of Agriculture and Fisheries. For the purpose of calculating the amount of the payment, he has to estimate the average price at which home-grown millable wheat will be sold during that cereal year. From this, the estimated “price deficit” per cwt., or the difference between the standard price and the estimated average price, is ascertained. The Minister has also to estimate the supply of flour that will be delivered and retained for consumption or use in the United Kingdom, excluding meal consumed, without further manufacture, as animal or poultry food. The quota payment is then calculated as follows :—

$$\text{Estimated price deficit} \times \frac{\text{anticipated supply (cwt.)}}{\text{estimated supply of flour (cwt.)}} = \text{quota payment per cwt.}$$

The quota payment may be varied by a subsequent order of the Minister of Agriculture and Fisheries at any time during the cereal year and if, at the end of the year, the Wheat Fund

shows a substantial surplus or deficit, he may fix the quota payment for the ensuing year at such rate as he considers expedient, or, if he is satisfied that the circumstances so require, he may suspend the liability to make the quota payments until further notice.

The quota payments are made to the Wheat Commission by every miller and every importer of flour in the United Kingdom in respect of each cwt. of flour delivered by them. Meal* sold, without further manufacture, for animal or poultry food, is not reckoned in a miller's liability in respect of quota payment, and any miller whose output does not comprise flour other than such meal may obtain from the Wheat Commission a provender miller's certificate which certifies that he is exempt from liability. Refunds of quota payments may be claimed on flour exported or shipped as stores and in respect of exported bread.

The Deficiency Payment.—The deficiency payment will become payable when an order has been made by the Minister of Agriculture and Fisheries prescribing the "ascertained average price" for the cereal year. As this average price cannot be ascertained until the close of the cereal year, the deficiency payment does not become due until after the year has ended; for example, the deficiency payment in respect of sales of home-grown millable wheat in the cereal year 1932-33 will not become due until after July 31, 1933. The Wheat Commission are, however, empowered to make to registered growers during the year advance payments on account of the deficiency payments to which they will become entitled.

Although, normally, the deficiency payment will represent the difference between the "standard price" and the "ascertained average price" (less a deduction for administrative expenses), in certain circumstances the sum actually payable may be somewhat less. If the sales of home-grown millable wheat in any year exceed the anticipated supply for that year, the deficiency payment, although payable in respect of all certified sales, will be reduced proportionately. For example, if the anticipated supply is 20,000,000 cwt. and the quantity sold is 22,000,000 cwt., the deficiency payment will be reduced by one-eleventh.

* "Meal" means, under the Act, as defined by the Fourth Schedule to the Fertilizers and Feeding Stuffs Act, 1926, either alone or mixed with other substances not being flour. (The Fourth Schedule to the Act of 1926 defines wheat-meal as the meal obtained by grinding commercially pure wheat, as grown.)

By-laws of the Wheat Commission.—The Wheat By-laws, 1932, made by the Wheat Commission, contain provisions relating to quota payments, the issue of provender millers' certificates, the registration of growers, the issue of wheat certificates, claims for deficiency payments and other matters concerned in the operation of the Act. Copies of the By-laws (price 6d. net) may be obtained from the Secretary, Wheat Commission, Westminster House, Smith Square, London, S.W.1.

Procedure to secure Deficiency Payments.—Unless a grower is registered with the Wheat Commission in accordance with the Wheat By-laws he will not be eligible to receive deficiency payments. Any grower, therefore, who desires to obtain the benefits of the Act and who is not registered, should communicate with the Commission. The subsequent procedure to qualify for deficiency payments is as follows :—

(1) When a registered grower sells any millable wheat of his own growing, he must apply for a wheat certificate to an "authorized merchant." The certificate will specify the quantity of wheat sold and the date on which it was sold, the price the grower obtained for it, the name of the person to whom, or to whose order, the wheat was dispatched on delivery and the date of dispatch, and that the wheat was millable wheat within the meaning of the Act.

(2) The applicant has to sign on the certificate a declaration that the statements of fact in the certificate are true.

(3) After receiving the wheat certificate signed by the authorized merchant, the grower must fill in, on the back of the certificate, the claim for deficiency payment in respect of the wheat certified and a request for payments in advance, and send the certificate to the Wheat Commission.

Authorized merchants are appointed by the Wheat Commission in accordance with the By-laws. It has been ascertained that lists of the names and addresses of authorized merchants will be supplied by the Wheat Commission to county branches of the National Farmers' Union of England and Wales, and of Scotland, to the Ulster Farmers' Union, and to county branches of the National Association of Corn and Agricultural Merchants. A registered grower who is aggrieved by a decision of an authorized merchant not to issue a wheat certificate may, within seven days of the date of the refusal to grant the certificate, appeal to a Local

Wheat Committee and the decision of the Local Wheat Committee upon the case will be final.

Registered growers must keep a careful record of their transactions in wheat—the quantities sold and bought in each month and the prices at which such wheat was sold and bought—and they may be called upon to furnish the Wheat Commission with a copy of the record. Growers may also be required at any time to furnish the Commission with a return showing the quantity of home-grown wheat remaining unsold by them at the date of the return.

The Secure Market.—The Act provides for the establishment of a corporation representative of millers, called the Flour Millers' Corporation.

During the months of June and July in any cereal year, the Corporation may be required by order of "the Minister" to purchase stocks of home-grown millable wheat (up to a maximum limit of one-eighth of the anticipated supply* for the year) remaining unsold in the hands of registered growers at the date of the order. The compulsory purchase order may only be made by the Minister if he receives a representation from the Wheat Commission that it is expedient to make such an order. Provision is made for the settlement by arbitration of disputes as to the price or quality of the wheat required to be purchased by the Corporation.

* * * * *

* For this purpose the maximum of 27,000,000 cwt. does not apply.

INEXPENSIVE METHODS OF HOUSING LIVE STOCK

A. W. OLDERSHAW, B.Sc.,

Agricultural Organizer for East Suffolk.

THERE is little likelihood, during the present financial stringency, of landowners embarking on the erection of elaborate farm buildings, although, in some instances, existing steadings will need to be altered or remodelled. It may be of interest, however, to consider how far expensive housing accommodation is really necessary for farm live stock, bearing in mind the mild climatic conditions that normally prevail in the British Isles. Recent investigations upon vitamins, mineral deficiency and other aspects of foodstuffs and feeding, and into such diseases as tuberculosis, all tend to the conclusion that both animals and human beings would benefit by greater exposure to sunlight and fresh air. This factor may, therefore, be considered in reviewing some of the ordinary methods of housing farm animals.

Horses.—During the winter, working horses in some parts of the country are kept in stables, but elsewhere in covered or partly-covered yards. The latter arrangement, permitting the animals to move about at will, is nearer to natural conditions and is consequently more likely to be healthy. Where horse yards are available, less stable accommodation is usually provided, the stable merely serving for feeding, grooming and harnessing the animals, most of whose time, when not working and at night, is spent in the yard. Those unaccustomed to this system may foresee danger from horses kicking each other, but in practice there is little to be feared with animals that have become used to each other when out at grass in summer. It would, however, be very unwise to turn a strange horse among others in a yard.

One advantage of a yard is that horse manure, or, indeed, manure from any class of stock, subject to trampling in a partially-covered yard, is less likely to lose nitrogen than when made into a heap and allowed to become hot. In a yard, too, there is less waste of liquid manure than in a stable.

In all but the most exposed districts, young growing horses are frequently left out-of-doors all the year round, with only a shed or a good hedge for shelter, and, provided they get plenty of food, this treatment seems satisfactory. In the southern and midland counties it is quite a common practice

to leave foals out in the fields with a shelter ; but, in the north, they are usually, if not always, housed during the winter. Given a shelter and plenty of food, working horses that require a rest nearly always benefit by being turned out to grass for a few months, even in winter.

Cattle.—Strong store cattle, such as breeding heifers, also thrive well out-of-doors in winter, provided they have plenty to eat and shelter is available. Even a belt of trees, or a thick hedge, on the north and east sides of the field, will be of great service as shelter. Partly-covered yards also form useful and healthy winter quarters for comparatively young stock, which often suffer severely from husk or hoose if kept out at grass in late autumn. Taking England as a whole, probably most of the cattle under 15 months of age are housed during the winter.

In East Anglia, a few cowkeepers turn their cows out to grass at night all the year round ; on some farms the animals pass the winter nights in a covered yard. These yards are usually well-ventilated and they are probably more beneficial for the health of the beasts than keeping them all night in a cowshed. Of 50 herds entered in Suffolk schemes for improving the cleanliness of milk, 24 spend the night in winter either in well-littered covered yards or out-of-doors on dry pastures. There is very good reason for believing that either method helps to keep the cows and their milk up to a high standard of cleanliness. In some districts, chiefly the northern and wetter parts of England, they are rarely let out even in the day time. They thus have very little exercise or access to fresh air and sunlight. The reason given for this treatment is the serious poaching to which the land is subjected when a herd of cows goes out to pasture in wet weather.

In southern districts (Dorset) the deciding factor seems to be the character of the land. Where the land is light and dry quite a considerable portion of the cows are allowed to remain out all night in winter, while on heavy land they are usually kept in all night and only allowed out for a certain amount of exercise during the day. In Kent, very few herds are kept out at night all through the winter ; and in other parts of southern and western England, cows, if kept out, are usually provided with shelter against inclement weather, while newly-calved cows are kept shut up.

In some instances, a herd of cows is kept principally for the production of calves ; hence, milk being only a secondary

consideration, such a herd is well-suited for an outdoor life in winter. Cows kept out-of-doors doubtless require substantially more food and may give less milk than those kept in, but they are probably less liable to tubercular infection.

Wintering Store Cattle in Scotland.—Mr. J. A. Symon has given some valuable information on the wintering of store cattle in Aberdeenshire.* He points out that the present returns from agricultural land do not warrant the erection of the expensive buildings hitherto deemed necessary for the housing of cattle, and that, where byres or covered courts have gone out of repair, the outdoor system may be worthy of consideration. He refers to experiments, conducted in 1927-28, with store cattle wintered outdoors, with overhead shelter, by Mr. M. Mackie in that county. These showed more than double the increase of weight attained by a similar lot wintered indoors. All the animals received turnips and straw. During the following winter, from December 3 to March 26, the following weight increases were obtained:—

	<i>Live weight increase per head in lb.</i>
Cattle wintering indoors in byres	27
Cattle wintering loose in half-covered court	98
Cattle wintering outdoors (with overhead shelter)	83

The North of Scotland College of Agriculture also conducted an experiment in Aberdeenshire the same winter (1928-29) to compare outdoor with indoor wintering of store cattle.† The indoor lot, housed in a byre, gave an average live weight increase of 132 lb. from November 5 to April 29, and of 81 lb. from then on to June 1, 84 lb. of turnips being eaten per head per day. The outdoor lot, which had overhead shelter, showed an average live weight increase, during the same periods, of 179 lb. and 113 lb., respectively, the turnip consumption being 118 lb. per head per day. The indoor lot, apparently, actually lost weight when first put out to grass, but the outdoor animals continued to put on weight throughout. Both lots had all the turnips they could eat, those out-of-doors consuming many more turnips but slightly less straw. In these experiments, it was also found that cattle receiving concentrated food during the winter did not do so well as those without it when first put out to grass in the summer.

* "The Management of Store Cattle in the North-East of Scotland." *Séct. Jour. Agric.*, October, 1930.

† *Scot. Jour. Agric.* Note in issue of January, 1932,

From these two Aberdeenshire experiments, it appears probable that, where suitable pastures are available, the system of wintering stock out-of-doors (with shelter) might be extended usefully to most parts of England.

Effect of Trampling.—The practice of turning horses and cattle out to grass in winter depends almost entirely, however, on the character of the soil. If a number of horses and cattle are kept out all the winter on a restricted area of pasture, severe poaching of the land is sure to occur, and this is definitely harmful on heavy and medium soils. On light land, and especially on chalk, the treading may do little harm and may, indeed, be actually productive of good, as on Mr. Hosier's farm in Wiltshire, where cows were kept out all the winter on rough grass containing much heather. The cows trampled the heather out of existence, the pasture, subsequently, being greatly improved by a dressing of basic slag. Concerning this practice, Mr. W. T. Price, the Agricultural Organizer for Wiltshire, states :—

Provided the land is suitable, i.e., light land and particularly chalk, the cattle will not do any harm, but a vast amount of good both through their treading and manuring. It is impossible to tread very rough, matted pasture too much, and improvement can be accelerated by seeding with a cheap seed mixture. As soon as the bail is moved on, the seed is broadcast over the old site and harrowed and rolled in. In practice, a bag of seed will be kept on the bail for this purpose. When, however, the land becomes improved after a few years—say—of the system, it becomes tenderer, and the bail must be moved more frequently. In really bad weather, it should be moved once a day.

On farms where the land is not all suitable, much can be done by selecting the driest and lightest pasture for winter work ; or, in extreme instances, the bail may be placed in the yard on a suitable concrete base and treated as a fixed milking yard during the winter.

In this connexion, Mr. L. S. Troup, writing on the Hosier system in Hampshire,* refers to the benefit derived by the land particularly in establishing pasture on naturally poor and impoverished soil. He states :—

The treading of the cattle on the thin soils, combined with the deposition of cake-fed urine and dung, direct on the land, produces a result very similar to that of the folding of sheep. The improvement of new pastures under this system is in many cases remarkable.

Much trampling has also proved beneficial in fields, under the writer's observation, where the pasture was covered with

* L. S. Troup. "Chalk Land Farming in Hampshire." *Jour. R.A.S.E.*, Vol. 92, 1931.

a spongy mass of undecayed vegetable matter due to shortage of lime or other causes. Here the trampling has helped to get rid of the spongy material and to promote the growth of wild white clover. There can be little doubt that most pastures benefit greatly by being eaten down bare during the winter, provided the trampling of the animals does not seriously poach the surface. Where severe poaching occurs on heavy soils through the trampling of the animals, it is practically impossible to keep them out-of-doors in winter, or even on light land in a wet winter. Land near gateways often gets into a very muddy state through the frequent passage of a large herd of cows.

Sheep.—Of all farm animals, sheep are most commonly allowed to remain out-of-doors in all weathers; and the question of housing for them, except in the matter of temporary lambing yards, need not be considered.

Pigs.—Upon the housing of pigs, ideas vary considerably. Some advocate elaborate buildings of the Swedish type, while others believe in keeping pigs out-of-doors with very simple and inexpensive shelter.

For breeding sows, probably most farmers would agree that a natural life is best, and that a sow should go out to graze so that she gets sunshine, fresh air and an opportunity of picking up various minerals that her system requires. Both sows and young pigs, when out at grass, are constantly searching out and eating materials for which they have a craving, and these are doubtless beneficial to them. That pigs enjoy winter sunshine is common knowledge, and sows may often be seen basking in it when the shade temperature indicates several degrees of frost. If provided with a simple shelter in a grass field, they rarely resort to it unless the weather is really very bad.

On the housing of fattening and store pigs there is greater divergence of opinion. Whether the Swedish type of pig-house, advocated on account of the severe climatic conditions of Scandinavia, will be equally efficacious in this country remains to be proved. In a fattening house of this type, recently erected by Messrs. Marsh & Baxter, Ltd., in Staffordshire, the growth-rates of pigs showed considerable irregularity, but experience of this type of housing in this country has been too short to draw any definite conclusions about it.

Pig-keeping is, however, being carried on successfully in England with very much simpler and less expensive housing

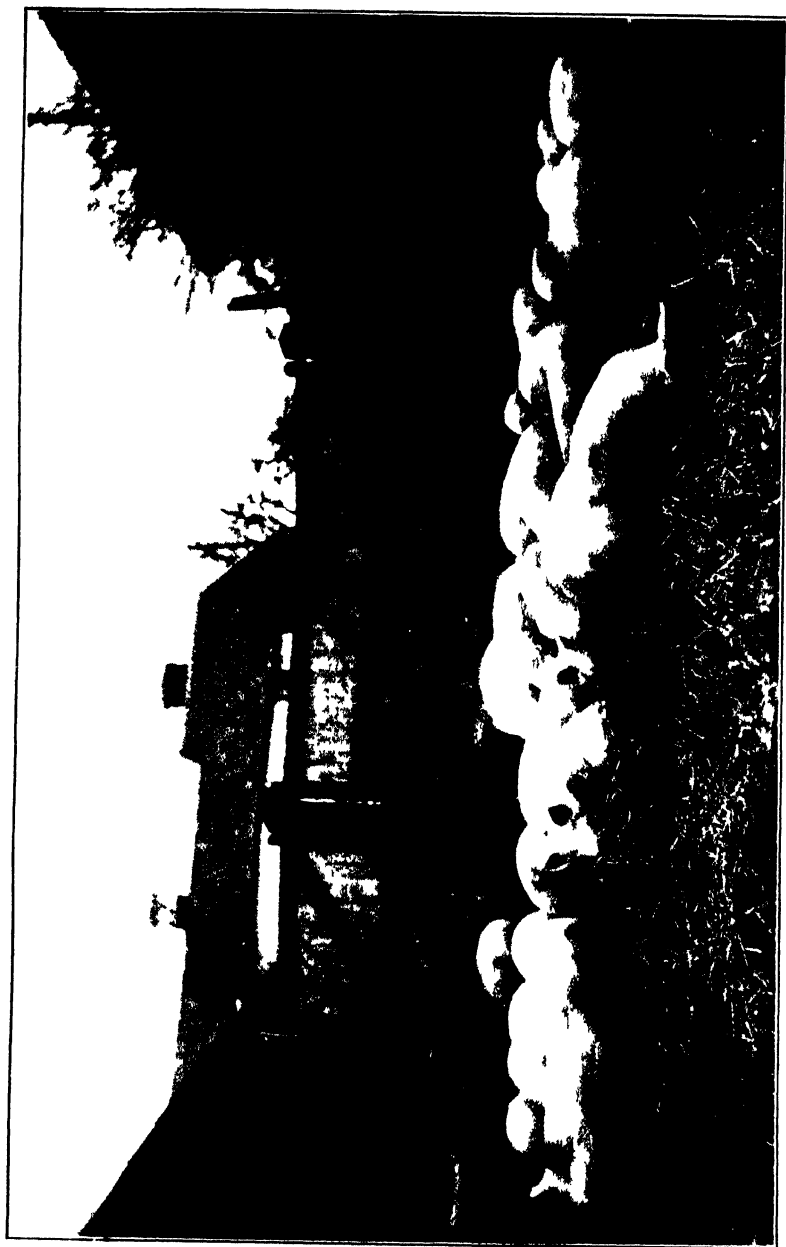


Pigs in a partly covered yard in East Suffolk



Pigs kept around a straw stack at Newbourn, East Suffolk

INEXPENSIVE METHODS OF HOUSING LIVE STOCK.



A Yard of Hogs pens in a partly covered yard in East Suffolk

provision. In Suffolk, it has long been customary to house pigs in partly-covered yards in preference to sties; "a yard of fat hogs" is a common Suffolk expression. Under these conditions, a large number of pigs can be kept with comparatively little expenditure on buildings, and, if the yard faces south, they get the winter sun.

Well-known breeders and rearers of pigs have found them to thrive better in simple huts, constructed of hurdles and straw, with an open run, than in more elaborate and expensive houses. That pigs of all classes fare as well under simple housing conditions as in farm buildings is also the experience of Messrs. C. C. Smith & Sons at Walton, Newbourne and Letheringham, in East Suffolk. Messrs. Smith have adopted, with great success, the simple expedient of building a straw stack in a field, away from buildings, but near a source of water. This straw stack is the centre of a run formed with hurdles and wire netting; and the pigs burrow into the stack, making comfortable quarters for themselves all round it. In winter, they may be found on the sunny and, on hot summer days, on the shady side of it. Even in the very severe weather of February, 1929, it was found that the pigs thrived better under this arrangement than in buildings.

This result may be attributed to the more natural regime, to the pigs getting more sun and air, and to the fact that, in the shelter of the straw stack, they are actually warmer, and certainly more comfortable, during the winter than in cold farm buildings on the concrete floors so often advocated. In addition, they have access to the soil and can root about for some of their food requirements.

The factor of disease may also be considered in this connexion. The piggeries at many farms have been in use for generations, and it is possible that pigs now housed in them are more liable to disease than those placed out on new ground. There is little doubt that parasitic worms of various kinds occasion great loss to pig-keepers, and that the incidence of these pests might be greatly reduced by keeping pigs on fresh and untainted ground. Straw stacks, it may be mentioned, should be erected in fresh places each year.

Another important point of this system is that, by keeping the pigs around a straw stack near where farmyard manure will be required, cartage will be saved or reduced.

Conclusions.—In considering the necessary housing requirements of farm live stock in England and Wales, the normal

mildness of the climate is a factor that should be taken into account.

As far as the animals are concerned, young horses and cattle appear to thrive well out-of-doors all the winter, provided they have plenty of food and simple shelter against bad weather. Even cows are not infrequently kept out day and night, throughout the winter, in the milder districts of England.

The practice of keeping horses and cattle out-of-doors during the winter, however, is dependent on the nature of the soil. On average good pasture, especially in the wetter districts, the animals, if too thick on the ground, may do serious damage through trampling. On the other hand, there are many dry pastures, especially those where the grass is rough and matted, where the trampling of the animals does good, at any rate for a time.

Where severe poaching of the land is likely to occur, it is practically impossible to keep the animals out-of-doors in winter. In such circumstances, as an alternative to the more costly farm buildings, it may be desirable to consider the practice, followed by many farmers who are amply supplied with straw, of keeping the stock in covered or partly-covered yards.

As regards pigs, many successful pig-keepers provide only the simplest housing ; in some instances, merely straw stacks for shelter.

The writer wishes to acknowledge his indebtedness for information on this subject received from Messrs. J. H. Faulder (Cumberland and Westmorland), T. R. Ferris (Dorset), G. H. Garrad, J. N. Sharrock and S. J. Travers (Kent), R. C. Gaut (Worcestershire), J. J. Green (Lancashire), J. Sherwood (Ipswich), and others whose names are given in the article.

REPORT ON THE WORK OF THE EDUCATION AND RESEARCH DIVISION OF THE MINISTRY FOR THE YEAR 1930-31*

PART I.—RESEARCH (INCLUDING LOCAL INVESTIGATION AND ADVISORY WORK)

THE work of the Ministry in connexion with agricultural research may be conveniently reviewed (after a few general remarks) under the following heads : (A) National Agricultural Research ; (B) Imperial Agricultural Research ; (C) Local Investigation and Advisory Work ; (D) Miscellaneous Experimental and Demonstrational Work ; (E) Scholarships, Fellowships, etc.

The total annual State expenditure is met from three sources, the Development Fund, the Empire Marketing Fund and the Ministry's Vote. The expenditure in the financial years 1930 and 1931 is given in Table I at the end of this Report (page 531). Of the total expenditure, which in 1931 amounted in round figures to £332,000 (a reduction of slightly over £30,000 on the figure for 1930), £293,000 was provided from the Development Fund, £30,000 from the Empire Marketing Fund, and £9,000 direct from the Ministry's Vote. It will be seen that more than half the expenditure took the form of grants to Research Institutes, and that the greater part of the remainder was for local investigation and advisory work at certain Universities and Agricultural Colleges.

General.—The events of the "research year" from October, 1930, to September, 1931, are over-shadowed by the financial crisis which occurred near its end and has for the time being suspended further developments. Even before the crisis, however, there had been some postponement of new activities pending the establishment of the Agricultural Research Council, which commenced operations in October, 1931. The history of the year, therefore, is not marked by many changes to which reference need be made in this brief review ; but there are one or two matters deserving of special mention.

(1) In the Report for 1929-30, it was observed that the

* The Annual Report on the work of the Education and Research Division of the Ministry for the year 1930-31 will not be published as a separate volume, as has been the custom in previous years. In place of the separate volume, a brief account of the work will be given by three articles in this JOURNAL, of which this is the first. The other two articles, dealing with the work of Education and Horticulture, respectively, will appear in the two following issues of the JOURNAL.

steady growth of the fruit and vegetable canning industry is one of the most encouraging facts in the recent history of British horticulture, and that both the canning firms and the growers would be the first to acknowledge how much they owe to the Fruit and Vegetable Research Station at Chipping Campden. The Station has for some years been developing upon the industrial side of canning, leaving on one side the other problems to which it was originally devoted. The logical outcome of this development is obviously that the activities of the Station should be confined to industrial canning and allied problems, and that it should be mainly or entirely supported by the industry. It is scarcely possible to expect the industry immediately to take over the entire charge of the Station, but a start in this line of policy has been made by transferring to the Research Station at Long Ashton, near Bristol, those items of work which are not directly connected with industrial canning, and by placing the Chipping Campden Station upon a subscription basis. It has been arranged that a block grant of £3,000 a year will be made to the latter Station for five years from October 1, 1931, and the canning companies and other industrial bodies interested have agreed to subscribe for the support of the work. These subscriptions now amount to more than a quarter of the total income.

The work of investigation and advice in the domestic preservation of fruit and vegetables is centred at Long Ashton, and courses of instruction are conducted by the Long Ashton staff at the Royal Agricultural College, Cirencester.

(2) For some years past a certain amount of work has been done on problems connected with vegetable production, notably at the Horticultural Research Station at Cambridge and the Experimental and Research Station at Cheshunt. But the extent of the work is not in the least proportionate to the importance of the vegetable industry. After consultation with the interests concerned it has been decided that the work of these two Stations should be developed—the former being equipped to deal with problems affecting field vegetables, and the latter being strengthened in facilities and staff for more work on the glasshouse crops which are its particular sphere of investigation. Some progress has now been made; a substantial addition has been made to the laboratories at Cheshunt, and money may soon be available for a moderate extension at Cambridge.

(3) The Small Animal Breeding Institute at Cambridge has succeeded in producing a pure breed of poultry in which

the male chicks are sharply distinguished at birth from the females by the character of their down. The new breed may have a direct and very marked value if it can be developed commercially; the question which confronted the Institute and the Ministry was how to bridge the gap between the successful experimental results obtained and the development of the breed to a point at which it could be made available for the poultry industry. This work is now being undertaken by the Animal Nutrition Institute at Cambridge, with the help of a trained geneticist transferred from the Small Animal Breeding Institute.

(A) National Agricultural Research: (1) *Block Grants to Research Institutes from the Development Fund.*—The Ministry's activities in connexion with agricultural research are principally concerned with the main research programmes carried out by agricultural research institutes with the aid of annual "block" grants from the Development Fund. The grants sanctioned for the years 1929-30 and 1930-31 are set out in Table II on page 531. In addition to the "block" maintenance grants, certain grants for capital expenditure have been made. A list of such grants sanctioned during the period October, 1929, to September, 1931, is given in Table III on page 532.

The "block" grants continue to be made generally on the same scale as for the past few years, with moderate additions to the grants to the Cambridge Horticultural Research Station and the Experimental and Research Station, Cheshunt, for the extension of vegetable research; but the grants for 1931-32 must reflect the economies rendered necessary by the present financial situation. A full statement of the investigations in progress at the various institutions is to be found in the volume published by the Ministry entitled *Reports on the Work of Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom, 1930-31*,* which also contains lists of the printed papers published by the institutions during the year.

(2) *Capital Grants.*—Four new capital grants were sanctioned during the year, all of them in respect of the developments briefly described in the first section of this Report. They were as follows:—

(a) £1,250 on a £ for £ basis to the Research Station at Long Ashton, for the increase of laboratory and other

* Copies of this volume and of the companion volumes for 1928-29 and 1929-30 may be obtained on application to the Ministry.

accommodation consequent on taking over part of the work previously conducted at the Chipping Campden Station.

(b) £1,000 to the Animal Nutrition Institute at Cambridge, to provide laying and brooding houses, mating pens, field laboratory, etc., for the work of developing the new light breed of poultry produced at the Small Animal Breeding Institute.

(c) and (d) £3,150 to the Experimental and Research Station at Cheshunt, and £600 on a £ for £ basis to the Horticultural Research Station at Cambridge, to increase their laboratory and other accommodation for the expansion of research into vegetable production.

(3) *Grants from the Development Fund for special problems.*—In addition to the “block” grants in aid of the main work of research institutes, supplementary grants on a deficiency basis, i.e., not more than sufficient to meet expenditure actually incurred, are made to enable research institutes and other centres to carry out specific pieces of investigation into special problems. The grants for the years 1929-30 and 1930-31 will be found in Table IV on page 533, which, for purposes of convenience, also includes a “block” grant (chargeable direct to the Ministry’s Vote) in respect of the Official Seed Testing Station and the Potato Testing Station at the National Institute of Agricultural Botany. The investigation carried out at Cambridge into silver leaf disease of fruit trees was concluded with the grant for 1930-31, and no further grant for this work is necessary. With this exception all the grants made in 1929-30 were continued. No fresh grants were awarded. Reports on the work carried out with the aid of these grants are to be found in the volume mentioned on p. 523.

(4) *Special Research Grants from the Development Fund.*—To enable individual workers or groups of workers to investigate problems of limited scope outside the main work of the research institutes, a number of small grants called “Special Research Grants” has been awarded annually on the recommendation of the Advisory Committee on Agricultural Science of the Development Commission. (This Committee has recently been dissolved in consequence of the formation of the Agricultural Research Council.) The grants are renewable from year to year, although normally not more than three successive grants are awarded for the same investigation. The grants made in 1930-31 are set out in Table V on page

533. All but three of the grants were renewals of previous grants, the three new grants being Nos. 4, 9 and 11.

(5) *Other Investigations financed direct by the Ministry.*—In addition to the grants from the Development Fund, described above, a number of grants was made during the year from the Ministry's funds in aid of certain miscellaneous investigations, usually of a minor character. These grants are set out in Table VI on page 534.

(B) **Imperial Agricultural Research :** (1) *Imperial Agricultural Bureaux.*—During the year under review, Sir Charles J. Howell Thomas, K.C.B., C.M.G., Permanent Secretary to the Ministry, continued to represent England and Wales upon the Executive Council of the Bureaux, while Mr. A. F. C. Clark took the place of Mr. W. R. Black, M.B.E., as liaison officer between the Executive Council and the Ministry.

(2) *Grants from the Empire Marketing Fund.*—A complete list of all agricultural research grants sanctioned from the Empire Marketing Fund up to September 30, 1930, and administered by the Ministry was given in the Report for 1929-30. Since the date mentioned one new grant has been made, and a supplementary grant has been made in respect of an existing scheme (see article, page 548).

The new grant is £250 per annum for three years, from October 1, 1930, to enable the Department of Zoology and Comparative Anatomy, Oxford University, to investigate the economic importance of the bird population of specific areas, special attention being given to the rook (a resident), the house martin (a migrant) and the little owl (an importation). The supplementary grant, of £100, was made to enable the comparative study of methods of soil analysis which is being carried out at the University College of North Wales, Bangor, to be continued until June 30, 1932; it was not possible to complete the work satisfactorily within the period of two years covered by the previous grants.

(C) **Local Investigation and Advisory Work.**—Complementary to the work of the research institutes is that carried out at the advisory centres established to serve the 14 areas or provinces into which England and Wales has been divided for this purpose. Each centre is attached either to a University with a Department of Agriculture or to an Agricultural College. In addition to carrying out investigations of local interest, the advisory officers keep in close touch with the work of research institutes concerned with their respective subjects, in order to be able to test their results under local

conditions, and communicate them, either directly or (more usually) through the medium of County Agricultural Organizers, to farmers in their areas. Table VII on p. 536 gives details of the grants made from the Development Fund in respect of the various advisory services.

The investigational work carried out by the advisers during the year is reviewed in the volume entitled *Reports on the work of Agricultural Research Institutes, etc.*, previously mentioned. Brief notes are appended concerning the work of each group of advisers.

(1) *Chemistry*.—Advisory officers in chemical problems are stationed at all 14 centres with the exception of Cardiff, the requirements of this province being met from other centres. As in previous years, the advisory work was concerned chiefly with problems of the soil, of manures and fertilizers and of feeding stuffs (including foodstuffs grown on the farm). Work in connexion with soil surveys, under the direction of the Soil Survey Conference, was continued by the advisers concerned. The Soils Correlation Committee, which is composed of certain of the advisory chemists, made a tour of investigation in England and Wales, and issued its First Report during the year.

(2) *Entomology*.—The advisory entomologists, 14 in number, are mainly concerned with the control of local attacks from insect pests. Another of their duties is to carry out surveys of the incidence of pests in their areas, their relative importance and the seasonal variation in intensity of attack. Their work is co-ordinated by the Ministry's Plant Pathological Laboratory, for which they act as intelligence officers and to which they send monthly and annual reports. The year was characterized by unusual weather: among other curious effects it may be mentioned that slugs were abnormally active. It becomes clear that the eelworm (*Heterodera Schachtii*) is an increasing menace.

(3) *Mycology*.—The 14 advisers in mycology, dealing with the fungus diseases of crops, act as intelligence officers for the Ministry's Plant Pathological Laboratory, to which they report upon the incidence of fungus diseases in their provinces. The abnormal weather during the year made it a busy one for the mycologists, for the effect was to encourage the attacks of fungi while at the same time weakening the crops' powers of resisting disease. Many advisers reported that it was the worst year in their experience; the attacks of familiar diseases were intensified, and normally unimportant diseases assumed economic importance, while preventive or curative measures were often hampered.

(4) *Economics*.—Eleven advisers were at work, the adviser at Aberystwyth acting for the whole of Wales, and the needs of the Oxford province being served by a member of the staff of the Agricultural Economics Research Institute.

(5) *Veterinary Science*.—During the year, the number of advisers was increased from 6 to 11, the new officers being appointed to the Bristol, Cambridge, Midland, Reading and Seale-Hayne centres. Most of the advisers report increased demands for specialist itinerant services, especially in connexion with diseases affecting poultry. Much of the work carried out during the year was concerned with diseases of sheep.

(6) *Dairy Bacteriology*.—Ten advisers were at work during the year. Most of them were engaged in analytical and advisory work arising out of county clean milk competitions, and, in two cases, county butter competitions. The advisers at the Bristol and Harper Adams centres have also been engaged on work connected with county registers of accredited milk producers. Co-operation with local health authorities is well maintained, and a number of commercial dairies have made it a practice to submit samples.

(D) Miscellaneous Experimental and Demonstrational Work :

(1) *Flax*.—The objects of the scheme for promoting the development of the flax industry in this country have been stated in previous Reports of the Work of the Research and Education Division.

The Flax Industry Development Society continued its operations, and further improvements in the technical handling of fibre at the factories were made. But it has not been found possible to reduce costs of production to the selling prices which have been ruling as the result of world-wide depression : consequently it was decided not to grow a crop in 1932.

(2) *Agricultural Meteorology*.—The number of stations co-operating in the Agricultural Meteorological Scheme was 32 ; of these 6 are continuing to keep precision records of wheat.

Among the matters arising out of the resolutions of the agricultural section of the Conference of Empire Meteorologists (1929), it may be mentioned that the bibliography of references and abstracts collected by the Ministry since the inception of the scheme has now been completed : this is being circulated throughout the Empire to departments and workers interested in agricultural meteorology. The question of observations on local climates has advanced a stage further, and a limited scheme of observations on micro-climatology has been commenced at Rothamsted.

(3) *Research into Foot-and-Mouth Disease*.—As formerly,

the main activities of the Foot-and-Mouth Disease Research Committee were confined to the Pirbright Experimental Station, where investigations on both large and small animals are carried out. With the object of enabling more experiments to be conducted simultaneously without increasing the risk of accidental infection, the Station has been organized into two main divisions, each with a separate staff for attending the animals: the Station can thus be run as two separate compounds in juxtaposition. Experiments on large animals are carried out only at the Experimental Station; work on small animals is done also in the laboratories of the Lister Institute, the National Institute for Medical Research, and the Public Health Department of the University of Manchester. The Fourth Progress Report of the Committee, which was published recently by H.M. Stationery Office, contains a detailed account of the various investigations carried out up to the end of 1930. A brief summary of the recent research work detailed in this Report was given in this JOURNAL for March, 1932.

The expenditure of the Committee during the financial year 1930-31 amounted to approximately £16,520. Salaries and wages accounted for £6,015, structural alterations at the Experimental Station, repairs, rates and farming expenses for £2,610, laboratory equipment, materials, animals and miscellaneous expenditure for £7,800 and the expenses of the Committee for £35. The Committee was set up in 1924 and the total expenditure up to the end of March, 1931, was approximately £89,500.

(4) *Agricultural Machinery Testing Committee*.—During 1930 and 1931, the Committee dealt with 26 applications for test. In the same period, 16 certificates and reports were issued, the machines and appliances having been tested at the Institute for Research in Agricultural Engineering, University of Oxford, and the National Institute for Research in Dairying, University of Reading. These machines and appliances included an oil burner, a fuel oil carburettor, an emulsifying machine for use with milk products, two mowing machines, three agricultural tractors, a threshing machine, three filter cloths, a milk strainer, a paper milk container and two milk-cooling plants.

The First Report of the Committee was published during 1931. This deals with the work undertaken, since the inception of the scheme in 1925, up to April, 1930, and contains copies of all the official certificates and reports issued in respect of individual tests which were available for publication up to

the end of July, 1930. Since that date the certificates and reports issued have been published as separate pamphlets as soon as they became available.

(5) *Advisory Committee on Agricultural Machinery.*—This Committee was appointed, in June, 1930, by the Minister to advise him on the development of the use of machinery in agriculture. The Committee consists of representatives of the National Farmers' Union, the Agricultural and Road Machinery Manufacturers' Association,* Agricultural Colleges, County Councils, Agricultural Workers, the Royal Agricultural Society of England, and the Institute for Research in Agricultural Engineering, under the chairmanship of Sir W. C. Dampier, F.R.S. Since its appointment six meetings of the Committee have been held, as well as a number of meetings of Sub-Committees. The Committee has presented to the Minister its First Report on the subject of Education in Agricultural Engineering.

(6) *Demonstrations of Agricultural Machinery.*—The demonstrations carried out in 1930 were mentioned in the Report on the work of the Research and Education Division for the year 1929-30 (pp. 20 and 21). The machines shown at these demonstrations included flax drills, machinery adapted to orchard and market garden work, harvester-threshers, and sugar beet toppers, lifters and elevators.

During 1931, four demonstrations were held of mole draining, six of horticultural machinery, and one of harvester-threshers.

(7) *Extension Lectures.*—Arrangements were made, as in previous years, for members of the staffs of Research Institutes and Advisory Centres to deliver lectures on all branches of agriculture at the request of Agricultural Organizers acting in collaboration with secretaries of branches of the National Farmers' Union. During the winter session, 1930-31, 211 lectures were given by 56 workers at 131 centres in 41 counties, the average attendance being 56.

(8) *Basic Slag.*—Experiments supervised by the Permanent Committee on Basic Slag have been continued, under the direction of the Director of the Rothamsted Experimental Station. The Committee's Ninth Interim Report was issued in August, 1931, comprising a record of the experiments carried out in 1930 and statistics showing the deliveries of basic slag by firms in Great Britain during recent years. For the grant approved for the experiments see Table VI on p. 534.

(9) *Electro-Culture.*—Experimental work is centred at the Research Institute of Plant Physiology, Imperial College of

* Previously the Agricultural Engineers' Association.

Science and Technology, supplemented by pot culture experiments at Rothamsted. The 13th Interim Report of the Electro-Culture Committee was issued in April, 1931.

(E) Scholarships, Fellowships, etc.—The Ministry has awarded for some years a limited number of post-graduate scholarships of two kinds: (a) research scholarships for persons intending to pursue a career in agricultural or veterinary research, and (b) general scholarships for intending agricultural organizers, teachers, etc. These scholarships have been awarded on the recommendation of the Advisory Committee on Agricultural Science of the Development Commission, mentioned in the section of the Report dealing with special research grants (see page 524). Research scholarships are normally of three years' duration and general scholarships of two years, the final year in each case usually being spent abroad. Particulars of the five research scholarships and six general scholarships awarded in July, 1931, are given in Tables VIII and IX on page 535.

The Advisory Committee has also recommended the award of travelling research fellowships to enable agricultural research and advisory workers to travel abroad in order to obtain a closer knowledge of the progress of research and advisory work in other countries, or to represent British agricultural science at international scientific conferences. During 1931, fellowships were held by Dr. Winifred E. Brenchley, of the Rothamsted Experimental Station, who studied the experimental methods in use in the U.S.A. for dealing with problems connected with plant nutrition; Dr. J. Henderson Smith, also of the Rothamsted Experimental Station, who investigated work on virus diseases in the U.S.A.; Mr. A. Jones, the advisory economist at the Midland Agricultural College, who studied the post-war development of live stock insurance in France, Germany and Belgium; and Mr. F. R. Petherbridge, advisory entomologist at Cambridge University, who investigated the pest-control methods employed in the U.S.A. and Canada. Grants were also made to three research and two advisory workers attending the International Dairy Conference held at Copenhagen from July 14 to 17. In addition, a grant was awarded to Dr. J. A. Venn, of Cambridge University, as a contribution towards the cost of a study of the organization of teaching and research in agricultural economics in certain foreign countries, which he undertook during a year's sabbatical leave granted by the University.

On grounds of economy no scholarships or fellowships are being awarded by the Ministry in 1932.

TABLE I.—EXPENDITURE ON AGRICULTURAL RESEARCH (INCLUDING LOCAL INVESTIGATION AND ADVISORY WORK) IN THE FINANCIAL YEARS 1930 AND 1931.

	1930 £	1931 £ (Subject to slight amend- ment)
(1) National agricultural research at Research Institutes, mainly of a fundamental and continuous character, but including also specific schemes		
Capital expenditure	16,910*	15,973*
Annual expenditure	167,096*	161,660*
(2) (i) Imperial agricultural research schemes at Research Institutes		
Capital expenditure	15,505†	6,856†
Annual expenditure	35,275†	23,324†
(ii) Contributions to Imperial Bureaux ..	3,125*	3,125*
(iii) Contribution to Imperial Institute of Entomology	—	1,500*
(iv) Contribution to Imperial Bureau of Mycology	—	750*
(3) Special research scheme for foot-and-mouth disease	16,513*	14,701*
(4) (i) Special research schemes, national and local, of a definite character and for a limited period	3,366*	2,098*
(ii) Ditto, but including some special schemes of a continuing character ..	3,312‡	2,200‡
(iii) Ditto Farm Management Survey ..	—	1,078‡
(5) Local research and specialist advisory work ..	73,571*	72,015*
(6) Post-graduate Scholarships (Research and Training), Fellowships, etc.	6,816*	6,976*
(7) (i) Testing of seeds and potatoes	5,325‡	5,170‡
(ii) Testing of agricultural machinery ..	62§	60§
(iii) Agricultural machinery demonstrations	496‡	509‡
(8) Flax Development—		
Capital expenditure	6,028||	483*
Loans (net) for working capital ..	19,336||	13,432*
	£362,612	£331,790

* Financed from Development Fund.

† Financed from Empire Marketing Fund.

‡ Financed direct from Ministry's Vote.

§ Receipts from fees exceeded expenditure.

|| Financed from Development Fund and Government of Northern Ireland.

TABLE II.—ANNUAL GRANTS TO RESEARCH INSTITUTES FROM DEVELOPMENT FUND.

Institute	1929-30 £	1930-31 £
<i>Soils and Crops :</i>		
Rothamsted Experimental Station ..	27,400 (23)*	27,800 (23)
Imperial College of Science	6,250 (5)	6,300 (5)
Cambridge Plant Breeding Institute ..	4,500 (4)	4,000 (3)
Welsh Plant Breeding Station	7,550 (5)	8,150 (5)
National Institute of Agricultural Botany (Administrative and Crop Improve- ment Branches)	4,500 (4)	4,500 (4)

<i>Institute</i>	1929-30 £	1930-31 £
<i>Horticulture :</i>		
Agricultural and Horticultural Research Station, Bristol	13,150 (10)	14,600 (12)†
Fruit and Vegetable Preservation Research Station, Chipping Campden ..	3,350 (3)	3,000 (3)
East Malling Research Station ..	8,300 (4)	8,550 (4)
Cambridge Horticultural Research Station Experimental and Research Station, Cheshunt.. .. .	1,800 (2)	4,100 (3)‡
	3,650 (4)	4,000 (6)‡
<i>Animal Pathology :</i>		
Royal Veterinary College	5,150 (5)	5,100 (5)
Cambridge Department of Animal Pathology	10,700 (7)	12,300 (7)
London School of Hygiene and Tropical Medicine	5,100 (4)	5,300 (4)
<i>Animal Husbandry :</i>		
Cambridge Animal Nutrition Institute ..	13,400 (12)	12,804 (8)§
Cambridge Small Animal Breeding Inst...	1,650 (2)	1,132 (2)
National Institute for Research in Dairying	13,200 (7)	14,300 (8)
<i>Economics :</i>		
Oxford Agricultural Economics Research Institute	6,700 (5)	8,400 (5)||
<i>Engineering :</i>		
Oxford Institute of Agricultural Engineering	12,600 (4)	12,700 (5)

* The figures in brackets indicate the number of graded research workers whose salaries are paid from the Development Fund.
† Includes provision for research work in products utilization and the home canning work carried out in former years at Chipping Campden.
‡ Includes provision for extension of vegetable research.
§ Includes grant for work transferred from Small Animal Breeding Institute.
|| Includes the separate grant previously made in respect of economic experiments in farming.

TABLE III.—CAPITAL GRANTS TO RESEARCH INSTITUTES FROM DEVELOPMENT FUND SANCTIONED OCTOBER, 1929, TO SEPTEMBER, 1931.

<i>Institute</i>	<i>Purpose of grant</i>	<i>Date sanctioned</i>	<i>Amount £</i>
Bristol: Long Ashton Research Station	Extension of laboratory accommodation	27.2.31	1,250
Cambridge:			
Department of Animal Pathology	Extension of accommodation at the field laboratories	9.4.30	4,250*
Horticultural Research Station	Extension of laboratory accommodation for increased vegetable research	10.2.31	600
Animal Nutrition Institute	New buildings for poultry nutrition	12.11.30	1,000
Rothamsted Experimental Station	Improvement of farm and farm buildings to allow of keeping live stock	28.3.30	1,700

* A grant of \$4,250 has also been approved for this purpose from the Empire Marketing Fund.

<i>Institute</i>	<i>Purpose of grant</i>	<i>Date sanctioned</i>	<i>Amount £</i>
Experimental and Research Station, Chesham	Extension of accommodation	24.11.31	3,150

TABLE IV.—GRANTS FROM DEVELOPMENT FUND FOR SPECIAL INVESTIGATIONS.

<i>Institution</i>	1929-30 £	1930-31 £
<i>Crop variety trials :</i>		
East Anglian Institute of Agriculture ..		
Harper Adams Agricultural College ..		
Lord Wandsworth Agricultural College ..	} 3,100	2,970
Norfolk Agricultural Station ..		
Somerset County Farm Institute ..		
<i>Testing of seeds and potatoes (a) :</i>		
National Institute of Agricultural Botany ..	5,325	5,325
<i>Testing of new varieties of fruit trees :</i>		
Royal Horticultural Society	1,000	1,080
<i>Virus diseases of potatoes :</i>		
Cambridge University	2,790	2,923
<i>Economic experiments in farming :</i>		
Oxford University	1,100	*
<i>Improved management of grass land :</i>		
University College of Wales, Aberystwyth	} 848	848
Bristol University		
<i>Pig husbandry :</i>		
Harper Adams Agricultural College ..	} 1,010	747
South-Eastern Agricultural College ..		
<i>Silver leaf disease of fruit trees :</i>		
Cambridge University	1,200	1,200
<i>Kent fruit soil survey :</i>		
East Malling Research Station	} 900	900
South-Eastern Agricultural College ..		

(a) Financed direct from the Ministry's Vote and not from the Development Fund.

* Amalgamated with block grant to Agricultural Economics Research Institute (see Table III on page 532).

TABLE V. —SPECIAL RESEARCH GRANTS FROM DEVELOPMENT FUND.

<i>Subject</i>	<i>Institute</i>	<i>Investigator(s)</i>	<i>Amount of grant 1930-31 £</i>
<i>England</i>			
1. Tar distillate spray fluids	Bristol : Ashton Research Station	Long C. L. Walton, F. Tutin and L. N. Staniland	150
2. Good and bad fields of wheat	Cambridge: School of Agriculture	G. D. Stevenson	313
3. Grassland investigations	Do.	—	69
4. Effects of stubble cleaning	Do.	W. A. Jones	307
5. Use of B.C.G. vaccine in the protection of calves against tuberculosis	Cambridge : Dept. of Animal Pathology	Prof. J. B. Buxton and Dr. A. S. Griffiths	343

<i>Subject</i>	<i>Institute</i>	<i>Investigator(s)</i>	<i>Amount of grant 1930-31</i> £
<i>England</i>			
6. Cause of deaths amongst ewes at lambing time	Liverpool University	Prof. S. H. Gaiger and K. D. Downham	15
7. Apple mildew	Oxford : School of Rural Economy	R. C. Woodward	75
8. Breeding of oats for resistance to Frit-fly	Do.	N. Cunliffe	273
9. Solids - not - fat in milk	Reading University	M. N. Nicholson and C. E. Lesser	200
10. Examination of data collected under the Ministry's Meteorological Scheme	Rothamsted Experimental Station	—	176
11. Broccoli breeding research	Seale-Hayne Agricultural College	F. R. Horne	116
12. Struck and gangrene diseases of sheep on Romney Marsh	Wye : South-Eastern Agricultural College	A. D. McEwen and R. S. Roberts	350
<i>Wales</i>			
13. Kemp in the fleece of Welsh mountain sheep	Bangor : University College of North Wales	Prof. R. G. White and J. A. Fraser Roberts	150

TABLE VI.—GRANTS FROM MINISTRY'S VOTE FOR MISCELLANEOUS INVESTIGATIONS.

<i>Investigation and Institution</i>	<i>Amount of grant 1930-31</i> £
<i>Beet molasses pulp inquiry :</i>	
Midland Agricultural College	} 257
National Institute for Research in Dairying	
Hertfordshire Institute of Agriculture	
Staffordshire Farm Institute	
<i>Costs of production of sugar beet :</i>	
Cambridge University	100
<i>Virus diseases of potatoes :</i>	
University College of North Wales	475
<i>Bacterial diseases of plants :</i>	
Imperial College of Science and Technology	250
<i>Eelworm experiments :</i>	
Harper Adams Agricultural College	} 115
Leeds University	
Manchester University	
<i>Agricultural meteorology :</i>	
Apparatus, observers' courses, etc., at various stations	350
<i>Basic slag experiments at various centres :</i>	
Rothamsted Experimental Station	211
<i>Pyrethrum trials :</i>	
South-Eastern Agricultural College	12
<i>Walnut cultivation :</i>	
East Malling Research Station	289

<i>Investigation and Institution</i>	<i>Amount of grant 1930-31 £</i>
<i>Causes of removal of cows from dairy herds :</i>	
Cambridge University	} 254
National Institute for Research in Dairying ..	
<i>Investigation of bulb troubles :</i>	
Imperial College of Science and Technology.. ..	30
<i>Investigation of the pig industry of Scandinavia :</i>	
Northamptonshire Farm Institute	70
<i>Blackening of potatoes after cooking :</i>	
King's College of Household and Social Science	115
<i>Sugar beet pathology investigations—preliminary expenses :</i>	
Cambridge University	24
<i>Mycological examination of tubers proceeding from indoor wart disease tests at Ormskirk :</i>	
Rothamsted Experimental Station	50
<i>N.B. for Table VI' see next page.</i>	

TABLE VIII. -RESEARCH SCHOLARSHIPS (DEVELOPMENT FUND)
AWARDED JULY, 1931.

<i>Name</i>	<i>Subject</i>	<i>Institute to which assigned</i>
K. Mather	Plant Genetics	John Innes Horticultural Institution
P. S. Watts	Veterinary Science	London School of Hygiene and Tropical Medicine
A. R. Wilson	Mycology	School of Botany, Cambridge
<i>One-year scholarships :</i>		
R. Melville	Plant Physiology	Imperial College of Science and Technology
Miss P. M. Edmunds	Dairy Bacteriology	National Institute for Research in Dairying

In addition, twelve scholars, whose appointments have been recorded in previous reports, were pursuing their studies, six being in their first year, four in their second year (one in the U.S.A.) and two in their third year (one in the U.S.A. and one in Germany). A thirteenth scholar, Mr. A. J. Pugh, held a temporary appointment at the Rothamsted Experimental Station during the year, and by a special arrangement the third year of his scholarship was held in abeyance.

TABLE IX. AGRICULTURAL SCHOLARSHIPS (DEVELOPMENT FUND)
AWARDED JULY, 1931.

<i>Name</i>	<i>Subject</i>	<i>Institute to which assigned</i>
D. S. Edwards	Animal Husbandry	School of Agriculture, Cambridge
R. B. Ferro	Crop Husbandry	School of Agriculture, Cambridge
A. L. Jolly	Agricultural Economics	University College of Wales
<i>One-year scholarships :</i>		
B. K. Randall	Horticulture	College of Agriculture, University of California, U.S.A.
F. Bennett	Animal Husbandry	Minnesota University, U.S.A.
Miss M. Morrison	Dairying	State Experimental Dairy at Hillerød, Denmark.

In addition seven scholars, whose appointments have been recorded in previous reports, were pursuing their studies, four being in their first year (one in the U.S.A.) and three in their second year (all in the U.S.A.).

MILK PRODUCTION ON ARABLE LAND

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It is common knowledge that in this country the association of live-stock and live-stock products with grassland farming is more definite, probably, than in any country in Europe. That there are economic difficulties in the way of the adoption of some of the Continental practices of stock-farming on arable land is generally realized, but if they could be overcome a long step forward would have been taken towards the increase of production from the land. The point arrested the attention of the members of the Agricultural Tribunal of Investigation, who in their Final Report* advised experimental work to explore the possibilities, and the Development Commission recommended a grant for financing a scheme by which the Ministry of Agriculture should acquire small farms, mostly of arable land, in milk-producing districts, to test one branch of arable stock-farming, namely, milk production. Every effort was made to procure normal conditions, as much like those under management by a working tenant as possible, for these State-provided farms, the management of which passed subsequently to the Agricultural Economics Research Institute, at Oxford. Much useful experience was gathered about the green-soiling system, and planning for a succession of crops, but the conditions were inherently artificial, and the test in this form was given up.

The Ministry of Agriculture and Fisheries decided next to make an investigation of the facts of milk production in some prominent dairying district of England where it was known that the farm holdings consisted largely of arable land, instead of having the predominantly pasture character of most of the great milk-producing areas. The work was entrusted to the Agricultural Economics Research Institute, and one of the intensive farming districts of Cheshire or South Lancashire at once suggested itself. After consultation with Mr. W. B. Mercer, Principal of the Cheshire School of Agriculture, at Reaseheath, a district in Mid-Cheshire was selected, where a high rate of milk production occurs, associated with a high ratio of arable land to permanent grass. An area was delineated, containing 205 farms, lying in the region between Sandbach and Alderley Edge to the south and north, and Macclesfield and Middlewich to the east and west.

* Agricultural Tribunal of Investigation, Final Report, 1924. Cmd. 2145.

The land varies from a very good to a good light loam. The rainfall is below the average for the West of England. Family labour amounts roughly to £1 0s. 0d. per acre, and employed labour ranges from £1 10s. 0d. per acre on the largely grass farms to £2 0s. 0d. per acre on the largely arable farms. The farmer's labour is excluded from the family labour assessment, but the district generally can be described as one of Family Farming. The typical crop rotation is a five-course—oats, roots, oats, seeds, seeds—with, frequently, a potato crop as a sixth course following the seeds, and always potatoes constitute an important part of the root break. Milk for liquid sale is every farmer's chief concern, irrespective of his percentage of arable land and of the size of his farm. The cattle are almost exclusively Shorthorns. The herds are replenished about equally by home-breeding and by imports, chiefly from Ireland. On individual farms, the tendency is either to rear all the cows required, or to buy all.

With the active collaboration of Mr. Mercer, each one of the 205 holdings was visited by the team of investigators, no selection of any kind being made. In the absence of accounts and having regard to the inter-action of the various departments of each farm, full particulars of the stocking and cropping, of the labour and of the income and expenditure, were necessary in every case in order to arrive at the real position of the dairy economy.

To facilitate the examination of the effect of varying proportions of arable and grass land on the quantity of milk production, the farms have been grouped on the basis of their ploughland percentage as follows: 0 to 30 per cent., 30 to 40 per cent., and so on up to the final group, 70 to 100 per cent. arable.

Distribution and Size of Farms.—Of the total of 205 farms, 135 are more than one-half arable. The largest farms fall between the 30 per cent. and 60 per cent. arable groups, that is, those of mixed arable and grass. It is interesting to note that size has no influence on the distribution of ploughland and pasture, for the percentage of arable to grass remained constant for all size groups.

Dairy Sales.—Table I shows that sales of dairy produce are practically constant for all groups. Whatever the proportion of arable to grass, milk sales expressed per acre or as a percentage of total farm income are unaffected, except on farms in the highest arable group, and even there the difference

TABLE I.—SHOWING INFLUENCE OF INCREASING ARABLE PERCENTAGE ON INTENSITY OF DAIRYING

Percentage arable land	Number of farms	Average size of farm Acres	Dairy produce sales :	
			Per acre	Percentage of total income
0- 30	13	36.5	£8.51	49.6
30- 40	17	86.0	£8.09	50.8
40- 50	40	80.6	£8.72	53.4
50- 60	67	83.0	£7.84	49.6
60- 70	47	70.1	£7.66	49.6
70-100	21	69.3	£7.00	40.8

is small. The terms of reference of the investigation were to relate arable percentage to milk production, to discover whether farms with a high arable percentage produced more milk than those with a low one ; in fact, to determine whether arable dairying, which is here practised, was more productive of milk than grass dairying.

The result as disclosed in the foregoing table is rather unexpected, though quite conclusive. There is no relation between the proportion of arable land and the intensity of milk production, anyhow in this district of Cheshire. The question arises whether some of the farms, possibly those in the smaller size groups, may not be engaged more in calf-rearing or raising dairy stock, processes that might obscure their real position when measured only by the sale of dairy produce. The figures in Table II, showing the sales of dairy stock per acre and as percentages of total income under different proportions of arable acreage, serve only to confirm the former result. There is general uniformity under practically all variations in the proportion of ploughland.

TABLE II.—SHOWING INFLUENCE OF ARABLE PERCENTAGE ON SALES OF DAIRY STOCK

Percentage arable land	Dairy stock sales	
	Per acre	Percentage of total income
0- 30	£2.35	13.7
30- 40	£1.74	10.9
40- 50	£1.83	11.2
50- 60	£1.75	11.1
60- 70	£1.83	11.9
70-100	£1.97	11.5

Conclusion.—This Mid-Cheshire area was selected for examination as providing, probably, one of the best districts in which milk production was associated with arable farming. If it may be assumed that the results disclosed would be repeated in any similar district, it is clear that the dairying system has been followed quite apart from the exigencies of

the ploughland and grassland ratio. Potato sales, from a negligible percentage on the largely grass farms, rise to 13 per cent. in the largely arable group. Poultry sales range from nearly 15 per cent. on the largely grass farms to 5 per cent. on the largely arable ones. Sheep and wool sales are irregular, but fall largely within the 20-40 per cent. group. Corn sales rise steadily from 0.2 per cent. in the largely grass group to 11 per cent. in the largely arable group. Pig sales remain constant throughout. Thus, these various sources of cash income, with the exception of pigs—which are independent of field operations—are adapted to the proportions of arable and grass, and, in the case of poultry sales, to size of farm, the largely grass farms being the smallest in acreage. Meanwhile, milk production, the mainstay of every farm, returns 50 per cent. of the total income for all proportions of arable land and for all sizes of farm. Milk products are expected to supply about one-half the cash returns, and everything else is organized to conform with this expectation. Farms with the higher arable ratio grow more and purchase more concentrates. They depend more upon seeds hay and less upon meadow hay. It is in these and similar ways that the adjustment is made, not by any variation in farm organization to affect the amount of milk production. The income per acre remains practically constant for all groups, in spite of these slight adaptations in farm economy to get the 50 per cent. of the total income from dairying, and in spite of the adjustments of other saleable crops and stock to varying percentages of arable and grass. The cash excess per acre of income over expenditure is greatest in the chiefly arable group, but varies irregularly for all others.

TABLE III

Percentage arable to grass	Cash income per acre £	Cash expenditure per acre £	Excess income over expenditure £
0- 30	17.15	14.25	2.90
30- 40	15.93	12.38	3.55
40- 50	16.33	13.31	3.02
50- 60	15.83	12.63	3.20
60- 70	15.43	12.61	2.82
70-100	17.14	12.88	4.26

Even in the details of the herd management and its results, neither arable ratio nor size of the holding has any measurable influence. Yields of milk per acre vary between narrow limits and show no tendency in any precise direction. Yields per cow are highest in the group 70-100 per cent. arable, and lowest in the 0-30 per cent. group, 654 as against 461

gallons a year. The intermediate groups show no definite trend from the average of 566 gallons. Even the form in which the milk is ultimately sold is uninfluenced by the factors under consideration. In all groups liquid sale accounts for 90 per cent. of the total production, and there was not observed any pronounced tendency towards retailing or, alternatively, towards wholesaling, as farms get larger or as the proportion of ploughland varies. These considerations, however, and others that arose in the course of the inquiry, are outside its particular scope, though the information is available for any who may wish to see it.

It is sufficient to say here that the cash income per cow and its relation to total income and expenditure—the real test of the working of arable as against grass dairying—remained constant for all proportions of arable land to grass. The determining factor in farm organization appears to be habitual practice in dairy herd management, which is applied to nearly every farm irrespective of the arable and grass land ratio. There is no attempt to exploit the arable land for a succession of heavy forage crops and increased milk-production.

* * * * *

METHODS OF HAND-MILKING: A COMPARISON

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It has been demonstrated repeatedly that methods are of paramount importance in the production of milk of good hygienic quality. The following experiment was undertaken to compare three methods of hand-milking and to show by which method it was possible to produce milk with the minimum of contamination. The methods used were (1) milking with clean, dry hands, (2) with clean, wet hands and (3) with clean, dry hands lubricated with vaseline.

When advising about the production of clean milk, it is often found difficult to convince hand-milkers that contamination may and does follow on the use of wet or greasy hands, and it may, therefore, facilitate advisory work if the results of an experiment such as this can be quoted in proof.

Wet-hand milking used to be very prevalent in some parts of England, but, fortunately, this most objectionable and unnecessary dirty method is definitely disappearing. On other farms the hands may be washed but are not dried and are further moistened by milk drawn from the cows' teats. This method, too, has little to recommend it. A milker's hands may be washed and dried before milking, but it is often found that they are kept wet by occasional applications of milk as the milking proceeds. That contamination does occur under these conditions is shown by results quoted later. Not only does wet-hand milking cause contamination of milk, but it is certain that, with sore and cracked teats, it is responsible for much trouble that is avoided where dry-hand milking is practised. It has been suggested that grease, such as clean vaseline, may be used on the hands during milking to lubricate and soften the teats if these are cracked, but it should be pointed out that teats seldom become cracked where milking is done dry-handed, and that the application of a suitable ointment to cracked teats after each milking will accelerate healing and will soften them sufficiently to enable milkers to work dry-handed at the succeeding milking.

As this experiment shows, greasy-handed milking has little to recommend it from the hygienic standpoint, although both the milker's hands and the grease were clean.

Plan of Experiment.—In this experiment the dry-handed milkers washed their hands thoroughly in soap and water and dried them on a clean towel before starting to milk. This was repeated after the milk from each cow had been tipped. The wet-handed milkers washed and dried their hands, but moistened them with milk before and during the progress of milking; while those milking with greasy hands washed and dried their hands, but rubbed them with a small portion of clean vaseline before starting to milk.

Precautions were taken to exclude as far as possible all sources of contamination likely to cause variation in the bacteriological content of the milk other than that arising from the condition of the milker's hands. These precautions were as follows :—

- (1) The choice of the farm with a small herd housed in one shed, so that strict supervision of milkers and methods was possible. The animals were in excellent condition both as regards health and cleanliness.
- (2) The rejection of an adequate quantity of fore milk.
- (3) The changing of milkers from one group of cows to another, and from one method of milking to another, in order to eliminate the effect of udder counts and of individuality in the milkers.

The work was done by the same three milkers throughout the experiment.

- (4) The experiment included both summer and winter months, being carried on during an eight months period from May to December, 1931.
- (5) Samples were taken by one of the writers (Miss Boyes) direct from the milking pails into sterile bottles immediately after milking, and consisted of milk from not less than four cows.
- (6) The samples were packed in ice immediately after taking, dispatched the same day by passenger train and were tested immediately on arrival at the laboratory.

The Results.—Table I shows the most striking feature of the results—the absence of *Bacillus coli* in all the samples of milk drawn with clean, dry hands.

TABLE I.—ABSENCE OR PRESENCE OF *B. COLI*

Method of milking	Number of samples	Absent	B. coli present in			
			1 c.c.	1/10 c.c.	1/100 c.c.	1/1000 c.c.
Dry ..	30	30	0	0	0	0
Wet ..	30	15	6	3	6	0
Greasy ..	30	16	5	3	3	3

The advantage of dry-handed milking is also striking when the bacteriological counts are considered, and by grouping these, as has been done in Table II, the comparison is clearly brought out.

TABLE II.—BACTERIOLOGICAL COUNT

Method of milking	Number of samples	Bacteriological (colony) count per c.c.			
		Number of samples in which count lay between			Over 30,000
		0-1,000	1,001-10,000	10,001-30,000	
Dry ..	30	22	16	—	2
Wet ..	30	3	16	4	7
Greasy ..	30	15	10	2	3

After the samples had been taken from the pails to be tested for bacteriological count, sediment tests were made by thoroughly mixing the milk and passing one pint through a Sutherland-Thomson dirt tester. The pads were awarded points for cleanliness, the maximum possible score being 100 points.

In Table III, these results are shown in summarized form and again show a distinct advantage for dry-hand milking.

TABLE III.—SEDIMENT TESTS

Method of milking	Number of samples	Score 0-60	Score 60-80	Score 80-100	Average score
Dry ..	30	5	9	16	72.5
Wet .	30	21	7	2	31.8
Greasy .	30	14	10	6	54.6

It is interesting to note that, towards the end of the experiment, the hair on the udders had become so long that they again required clipping, and the sediment pads from the milk drawn with wet hands showed the presence of very many hairs. The pads from the milk drawn with greasy hands showed fewer hairs, while the dry-handed pads only showed occasional hairs.

In conclusion, the results indicate that milk drawn with clean, dry hands is cleaner than milk drawn by wet or greasy hands.

THE MINERAL REQUIREMENTS OF PREGNANT SOWS

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IN recent years the mineral requirements of growing fattening-pigs have received considerable scientific study. In general, the results confirm the supposition that, unless they contain fish meal, meat and bone meal, or dairy by-products, ordinary pig rations are deficient in certain mineral or ash constituents, and are thus ill-balanced. It has also been demonstrated that the feeding of a "simple" mineral mixture is as effective for correcting these deficiencies as are complex mixtures containing bone meal, potassium iodide, manganese and other expensive ingredients. Practical trials seem to show that a mixture of three parts of ground limestone and one part of common salt, incorporated daily in the ration in the proportion of 2 per cent., produced healthier animals, more economical gains and greater profit than could be obtained by feeding the same ration without these added minerals.

The mineral requirements of in-pig sows, however, have not received nearly so much attention, probably because the skeletal needs of the mature animal are relatively small. Yet it needs to be emphasized that the mineral demands of a sow producing two litters each of 8 to 10 pigs, annually, with two lactation periods, each of seven to eight weeks' duration, are considerable, and their extent and nature are discussed below.

Effects of Mineral Deficiency during Pregnancy.—The effects of mineral deficiency on brood sows are most evident about the time of farrowing. In an experiment recently carried out at the Animal Nutrition Institute, it was shown that, if the food was deficient in lime over a period, farrowing became very protracted, with the result that the sows were unable to stand for two or three days afterwards. This led to the loss of whole litters, while the sows became very thin and unthrifty, with consequent delay in the subsequent onset of œstrus (heat) and mating. Of equal economic significance was the extremely small milk-yield of the lime-deficient group, the size of the udders, after farrowing, being markedly smaller than those of another group which had received a similar ration supplemented by about an ounce of ground limestone. The heavy mortality among the progeny was probably due to the lack of milk in the mineral-deficient sows, whose surviving piglings made very unthrifty live-weight gains, while among these survivors there was a high percentage of deaths at weaning time. It should be noted, however, that the offspring of the lime-deficient sows were quite normal in weight and appearance at birth, so that it would appear that, up to the time of parturition, it is the sow that suffers from a mineral-deficient diet and not her offspring.

Mineral Requirements of In-Pig Sows.—To obtain information about the mineral requirements of pregnant sows, metabolic experiments were carried out, the total amounts of lime, phosphate, potash and salt fed in the ration, and excreted in both urine and fæces, being determined. In this way, the quantities of these mineral substances retained in the body at different stages of gestation were ascertained. The experiments were conducted on a balanced ration consisting of barley meal, maize meal, bean meal and blood meal with the addition of $\frac{1}{2}$ lb. of common salt per 100 lb. of the mixed meal. Group A received the above ration only; with Group B, the ration was supplemented by about 1 oz. of ground limestone

per day. The relevant data for calculating the mineral requirements are given in Table I.

TABLE I.—AVERAGE DAILY AMOUNTS, AND TOTAL AMOUNTS DURING GESTATION, OF MINERALS RETAINED IN THE BODY BY THE IN-PIG SOW

	<i>Average Daily Retention Grammes</i>		<i>Total Amounts Retained during 115 days Gestation Grammes</i>	
	<i>Group A Basal Diet only</i>	<i>Group B Basal Diet + limestone</i>	<i>Group A Basal Diet only</i>	<i>Group B Basal Diet + limestone</i>
Lime (CaCO_3) ..	0.33	11.43	38	1,314
Phosphate (P_2O_5) ..	5.62	6.26	646	720
Potash (K_2O) ..	0.96	1.75	110	201
Salt (NaCl) ..	3.33	2.50	383	288

It will be observed that sows on a balanced ration, largely composed of cereal meals, may only retain $1\frac{1}{2}$ oz. of limestone during the whole period of pregnancy, whereas, when sufficient lime is provided, the amount retained is approximately 47 oz. The deficiency of about 46 oz. of lime has, therefore, to be supplied by the lime-deficient animal through the depletion of its own skeleton, which explains the weakness of the sows after farrowing and the fact that they were unable to produce milk.

The retention of phosphate and potash was quite satisfactory in both groups of sows, although these two substances were not supplemented in the ration, showing that there is no need to include either phosphatic or potassic salts in mineral mixtures for swine. The inclusion of $\frac{1}{2}$ lb. of common salt per 100 lb. of mixed meal also provided amply for the requirements of sodium and chlorine.

From the data given in Table I, the daily requirements of chalk and salt are 11.43 grm. of the former and 3.3 grm. of the latter. Mitchell also concludes, from recent experiments (at the University of Illinois) on the deposition of lime in the pregnant uterus, that the minimum daily requirement of lime by a sow with eight *fœtuses* is 10.7 grm., the Cambridge and Illinois figures showing close agreement. Since only 50 per cent. of the lime present in the food is assimilated by swine and becomes available for retention, the chalk requirement becomes 23 grm. per head daily, equivalent to approximately 1 oz. of ground limestone (85 per cent. CaCO_3). Similarly, assuming that 60 per cent. of the salt fed becomes available, the daily requirement becomes $5\frac{1}{2}$ grm. A suitable mineral mixture for pregnant sows can, therefore, be made by mixing 80 lb. of chalk and 20 lb. of common salt. This should be fed at the rate of just over 1 oz. per head per day.

If the daily ration of an in-pig sow is taken at 6 lb. of mixed meal, the amount of the above mineral mixture to be incorporated with 1 cwt. of the mixed meal is 1 lb. 3 oz.

In this connexion, it should be emphasized that thorough mixing both of the mineral mixture itself and of the mineral mixture with the mixed meal is essential, or individual sows may receive excessive and possibly harmful quantities of the mineral mixture. In the feeding of common salt, for example, moderate amounts have been shown to be very beneficial to pigs, but excessive quantities are poisonous in effect.

To provide a small margin of safety, the amount of lime and salt present in the foodstuffs used in the Cambridge experiments was not taken into consideration. It may be of interest, however, to compute the amount of chalk present in a ration (not including fish meal) such as is commonly fed to in-pig sows in this country. The following may be taken as a typical mixture :—

<i>Mixture</i>	<i>Percentage of lime as CaCO₃</i>	<i>Total chalk or limestone</i>
<i>lb.</i>		<i>lb.</i>
10 soya-bean meal	0.52	0.052
25 sharps	0.17	0.043
40 barley meal	0.15	0.060
25 maize meal	0.03	0.008
<hr/>		<hr/>
100		0.163

If the above ration is fed to sows at the rate of 6½ lb. per day, the supply of chalk is 4.8 grm., or one-fifth of the amount of lime necessary. Similar figures for the salt content cannot be calculated because of the unreliability of some of the data available. If half the soya-bean meal in the typical ration above were replaced by 5 lb. of fish meal, the chalk present would be 26 grm. and the addition of minerals would be unnecessary. It should be noted that the above figures apply to winter feeding, or to sows without access to good grazing. The value of pasture grass as a source of minerals for pigs may be judged from the fact that a sow consuming 2 lb. of dry substance (8 lb. of fresh grass) per day would receive thereby about 24 grm. of chalk and about 6 grm. of salt, these amounts representing her daily requirement. A pregnant sow, having access to good grazing, needs very little mineral supplement.

It may also be of value to compute the quantity of the mineral mixture required by the sow during lactation. The

average daily milk-yield of a sow is $10\frac{1}{2}$ lb. Since the milk contains the equivalent of 0.7 per cent. CaCO_3 , the loss to the sow in the milk is 33.3 grm. and, to prevent this amount being taken from her frame, it will be necessary to feed 67 grm. of chalk. This quantity would be furnished by 3 oz. of the mineral mixture or, taking the food consumption during lactation at 13 lb. of mixed meal, the necessary lime requirement would be provided by the addition of $2\frac{1}{2}$ oz. of the mineral mixture.

Summary.—A suitable mineral mixture for in-pig sows (not having access to good grazing) should contain chalk and common salt in the proportion of four parts of the first to one part of the second. This should be fed at the rate of 1 oz. per head per day. During lactation, about $2\frac{1}{2}$ oz. of the mineral mixture would be required per head daily.

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THE EMPIRE MARKETING BOARD AND AGRICULTURAL RESEARCH IN ENGLAND AND WALES

IN the Sixth Annual Report of the Empire Marketing Board, covering the year May, 1931, to May, 1932, considerable space is devoted to the grants made by the Board for research work. The following is a brief account of experiments carried out with the help of grants made by the Board to research institutions in England and Wales and administered by the Ministry on behalf of the Board.

Storage and Preservation Problems.—Four research stations have been investigating various aspects of the problems connected with the storage and preservation of meat, fruit and vegetables.

At the Cambridge Low Temperature Research Station, practical problems connected with the preparation and storage of beef, mutton, pork and bacon are being studied, and the critical examination of the rapid-freezing process is being continued. A large-scale experiment has shown that bacon of good quality can be made from frozen pork, which is now being imported in considerable quantities from Australia and New Zealand. The transport of mild-cured, green bacon in the frozen condition from these two Dominions cannot, however, be carried out successfully by ordinary commercial methods; but other methods are being investigated.

Considerable progress has been made in the practical application of gas-storage to fruits and vegetables, and the new method of storage makes it possible for the home grower to market his apples over a whole year. The preservation of fruits and vegetables by freezing has also been studied and, in many instances, has been shown to be superior to the preservation attainable by canning, but difficulties have sometimes arisen, and these are being investigated. Work on the rate of moisture evaporation from stored materials has been continued, with particular reference to eggs, cheeses and apples. Study of the raw materials of tin-plate used in canning has shown wide variations in the susceptibility of different sheets, or even different portions of the same sheet, of the steel base to attack of a given fruit acid. An attempt is, therefore, being made to discover the factors that have most influence on the steel base during manufacture.

At the Ditton Laboratory, East Malling, the efficiency of different cooling circuits for the storage of fruit was investigated. Experiments on the gas-storage of fruit are in progress.

At the Biological Field Station, Slough, of the Imperial College of Science and Technology, work on the insects and fungi that infest stored products continues to be supported by the Board. The main problems that are being studied are the reactions of living organisms to temperature and humidity conditions, and to gases inhibiting or deterring biological processes. Improved methods of fumigation have been suggested and introduced in practice. Advice and co-operation are being sought both by colonial departments of agriculture and by wharfingers, merchants and firms in the chemical industry. Funds have been provided by various firms for the investigation of insects attacking their products in store; this is especially so with tobacco investigations, for which the Southern Rhodesian Government has also provided funds. On account of the need for economy, the work has been reorganized to allow a steady programme of basic research work to be carried out; the survey and inspection work will, in future, be undertaken on a basis of repayment by the interests concerned.

At Long Ashton, the experiments on the effect of certain orchard factors on the storage qualities of fruit have been extended, and substantial progress has been made. The most important facts that have emerged are (1) that, in assessing the effects of pre-storage factors on storage life, it is important to specify exactly the details of storage condi-

tions ; (2) that the storage life of fruits (under any given set of storage conditions) is determined by the interaction of orchard and other pre-storage factors ; (3) that pre-storage factors not only affect the length of storage life, but may actually alter the form of breakdown that occurs. On the chemical side, facts have been ascertained concerning the contents of nitrogen, sugars and potash in fruits.

Sir William Dampier, in his Survey of Dairy Research, undertaken on behalf of the Board, recommended that work on the storage of milk and the ripening and storage of butter and cheese should be concentrated at the National Institute for Research in Dairying at Reading. A grant for the erection, at this Institute, of a small low-temperature station was recommended by the Board in July, 1931, but the financial crisis made it impossible for the Board to implement its recommendation.

Blow Fly Research.—In September, 1929, the Board made a grant of £1,500, to be spread over three years, to the Department of Entomology of the London School of Hygiene and Tropical Medicine, for research work on the digestion of meat by the larvæ of flies, and on the part played by micro-organisms in the nutrition of the larvæ. (The Blow Fly has caused great damage to sheep in all pastoral countries.) Dr. Hobson has solved two problems, (a) the method by which the maggot digests its food, and (b) the relation, found to be unimportant, between maggot and bacteria. It remains to solve the problems : (1) What it is that attracts the fly to lay eggs on the sheep ; (2) How the maggot penetrates the skin ; (3) How much of the damage, under natural conditions, is due to the larva and how much to bacteria. The work already done should help in the solution of these problems.

Virus Diseases of Plants.—The working season has been considerably extended at the Rothamsted Experimental Station by the use of lamps that have artificially prolonged winter daylight. Further work has confirmed the previous findings that virus does not travel through the plant in the water stream, and probably exists almost entirely inside the cells ; a method has been devised of estimating the number of virus particles present. At the Experimental and Research Station at Cheshunt, the past season's work has confirmed the fact that Mosaic disease of the cucumber, tomato and tobacco is carried in the seed. The effect of the virus of Mosaic disease on the metabolism of the tomato has been studied. A form

of disease, known to growers as "peppery stripe," has proved to be the result of infection with a mixed virus and is not identical with "stripe." The work at Rothamsted on the angular leaf-spot disease of cotton, for which the Board gives a special grant, has been continued and the influence of air temperature, atmospheric humidity and alternating environmental conditions on the disease have been studied.

Breeding of Pedigree Grasses.—At the Welsh Plant Breeding Station, Aberystwyth, the seed production of grasses has been the chief subject of study. Investigations have been conducted into the effect of various manures and the effect of the time of their application, the management of grasses and the possibility of autumn sowings for seed production, the rate of sowing and the effect of harvesting at various stages of ripeness on the quality of the seed. Over 200 acres have been sown with the seed of pedigree strains in experimental sward trials. Research seems to show that delayed establishment in some species of cultivated grasses is to be explained by the ability of their seedlings to persist for long periods in a latent condition and to develop normally afterwards. The effect on other grasses of competition with *Lolium italicum* has been thoroughly studied. Unsuccessful attempts have been made to stimulate the germination of grass seeds by soaking them in chemical solutions, but soaking in water has some effect on germination. Many strains are received each year from overseas for growing-on and for critical report. Differences in rye-grasses have been confirmed by results obtained from strains brought from New Zealand.

East Malling Research Station.—During 1931, papers were published discussing the results of the three years' routine work of the Statistical Section in computing and analysing 12 years' data upon individual trees; also a paper summarizing all the automatic devices used by the Station in its biometrics. Consignments of vegetative stocks were sent to all the Dominions, and the demand by the home trade is rapidly developing. The breeding and testing of a range of stock immune from Woolly Aphis attack is proceeding in collaboration with the Fruit Geneticist at the John Innes Horticultural Institution. The troubles of the strawberry and the cane fruits are being investigated. Progress has been made in the analysis of the principles underlying root-stock scion influence and in the search for more intimate knowledge of the annual cycle of the fruit plant. It has been established

that there are significant differences in the leaf relations of trees on different stocks.

Wild Rodents Research.—The investigations being carried on at the Zoological Department of the University of Oxford concerning fluctuations in numbers of wild rodents, and factors controlling the reproduction and breeding seasons of wild field mice, have reached an advanced stage. The fact has been confirmed that voles and mice have definite cycles of abundance and scarcity that can be correlated with those of other animals and with meteorological conditions. The more important factors controlling breeding have been demonstrated. The original grants from the Board for these investigations expired on June 30, 1931, but a small supplementary grant was approved to continue the work on fluctuating numbers and on breeding until December 31, 1931. The University of Oxford have made a small grant for the continuation of these experiments during 1932, and the Royal Society have also given a special grant for research on fluctuations in wild vole populations in Great Britain.

Cambridge University.—The Board is giving a grant of £50,000, to be paid in five annual instalments of £10,000 each, to Cambridge University in aid of the scheme for the development of the Biological and Agricultural Departments agreed between the University and the International Education Board of the Rockefeller Foundation. The first two years' instalments of £10,000 have been paid by the Board and sites have been allocated for the extensions of the Schools of Agriculture, Botany and Physiology.

Other Investigations.—Other investigations, still in progress at English and Welsh research institutes, that are financed from the Fund, include research in poultry nutrition problems and in the physiology and growth of farm animals, at the Animal Nutrition Institute, Cambridge University; the study of the production and marketing of table poultry and eggs at the Harper Adams Agricultural College; the study of the technique of milk investigation at the London School of Hygiene and Tropical Medicine; experiments with plants of the tidal zone, with special reference to *Spartina Townsendii*, at the East Anglian Institute of Agriculture, Chelmsford; research into economic ornithology at the Department of Zoology at Oxford University; and the collection and dissemination of data concerning the economics of agricultural

production within the Empire, with special reference to the technique and results of cost-accounting and survey methods, at the Agricultural Economics Research Institute, Oxford. Grants have also been made to the School of Agriculture, Cambridge, for the erection of a silo for trials of the economic value of silage made from grass; and to the Ministry of Agriculture for investigations into problems of marketing.

The following fresh grants were approved by the Board during the year, June, 1931, to May, 1932: a grant of £30,133 to the Department of Scientific and Industrial Research for the continuation, during 1932-33, of food preservation and low-temperature research at Cambridge, East Malling and Aberdeen; a grant of £36,500 to the Ministry of Agriculture and Fisheries for the continuation, during 1932-33, of investigations into the marketing of home agricultural products, with special reference to the improvement of the existing methods of distribution and preparation for market. All the other grants mentioned in this account were outstanding as at May, 1932, though on account of the financial stringency reductions ranging from 10 to 30 per cent. have had to be made.

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MARKETING NOTES

National Mark Eggs.—The total output of the National Mark Egg Packing Stations for the six months January to June, 1932, inclusive, was 224·3 million eggs, of which 181·0 millions were packed under the National Mark, compared with 173·6 millions and 129·1 millions, respectively, in 1931. The following table shows the aggregate monthly output of the stations during these periods :—

1931				1932			
Month	Total output of packing stations	Output under the National Mark	Percent- age of output under the National Mark	Month	Total output of packing stations	Output under the National Mark	Percent- age of output under the National Mark
	Millions	Millions			Millions	Millions	
Jan. ..	21·5	16·0	74	Jan. ..	27·2	21·9	80
Feb. ..	21·9	17·0	78	Feb. ..	30·7	25·6	84
Mar. ..	31·6	24·3	77	March ..	45·1	36·2	80
April ..	34·6	25·0	72	April ..	43·5	34·7	80
May ..	32·5	23·4	72	May ..	40·1	32·5	81
June ..	31·5	23·4	74	June ..	37·7	30·1	81
					(approx.)	(approx.)	
Totals for six months	173·6	129·1	74	Totals for six months	224·3	181·0	80

Egg packers are beginning to realize that it is not only in their own interest, but also in that of their suppliers, for eggs to be purchased from producers on a grade basis instead of on a count basis as has hitherto been the more common practice. The number of packers who purchase on a grade basis is steadily increasing.

National Mark Dressed Poultry.—There is a growing tendency for authorized packers of National Mark eggs to turn their attention to poultry packing, so rendering fuller service to their suppliers. One of the largest of these packers has recently applied for authorization in the National Mark poultry scheme.

There have also been developments on co-operative lines. A company has been registered for the purpose of running a co-operative poultry packing station in Norfolk, where operations are expected to commence next month, and in Buckinghamshire the formation of a co-operative poultry producers' society is being explored.

An entirely new development is the introduction by the Ministry of a scheme under which short courses of instruction in the feeding, plucking, stubbing, grading and packing of poultry are given at certain poultry packing stations. Only packers, or employees of packers, who have enrolled in the National Mark poultry scheme, or who have made application for enrolment, are eligible for these courses.

During recent months, the low prices ruling for dressed poultry on the wholesale markets have adversely affected the proportion of birds packed under the Mark. Nevertheless, during the first six months of 1932, out of an approximate total output of 145,000 birds, the authorized packing stations packed 40,000 birds under National Mark labels.

National Mark Fruit.—Further progress has been made in the enrolment of packers of National Mark plums, and the number of authorized packers has now reached a total of 88.

It is interesting to learn that several salesmen in Manchester who have handled consignments of National Mark strawberries have been well pleased with the quality and grading. There seems to be a big potential demand for well-graded fruit, and it is significant that National Mark strawberries have made as much as 2½d. and 3d. per lb. more than ungraded English fruit. The only complaint referred to the lack of a continuous supply of National Mark fruit, and this should be an encouragement to growers to make further efforts next year.

Proposed National Mark for Cabbage Lettuce.—With the object of introducing in 1933 a National Mark Scheme for cabbage lettuce, the Ministry has consulted with leading growers and formulated proposals for standard grades and packages for cabbage lettuces grown (1) entirely under glass, and (2) in the open. The proposals are put forward for consideration and voluntary adoption by those interested in this crop. The grades suggested are *Selected Glasshouse*, *Standard Glasshouse* and *Selected*.

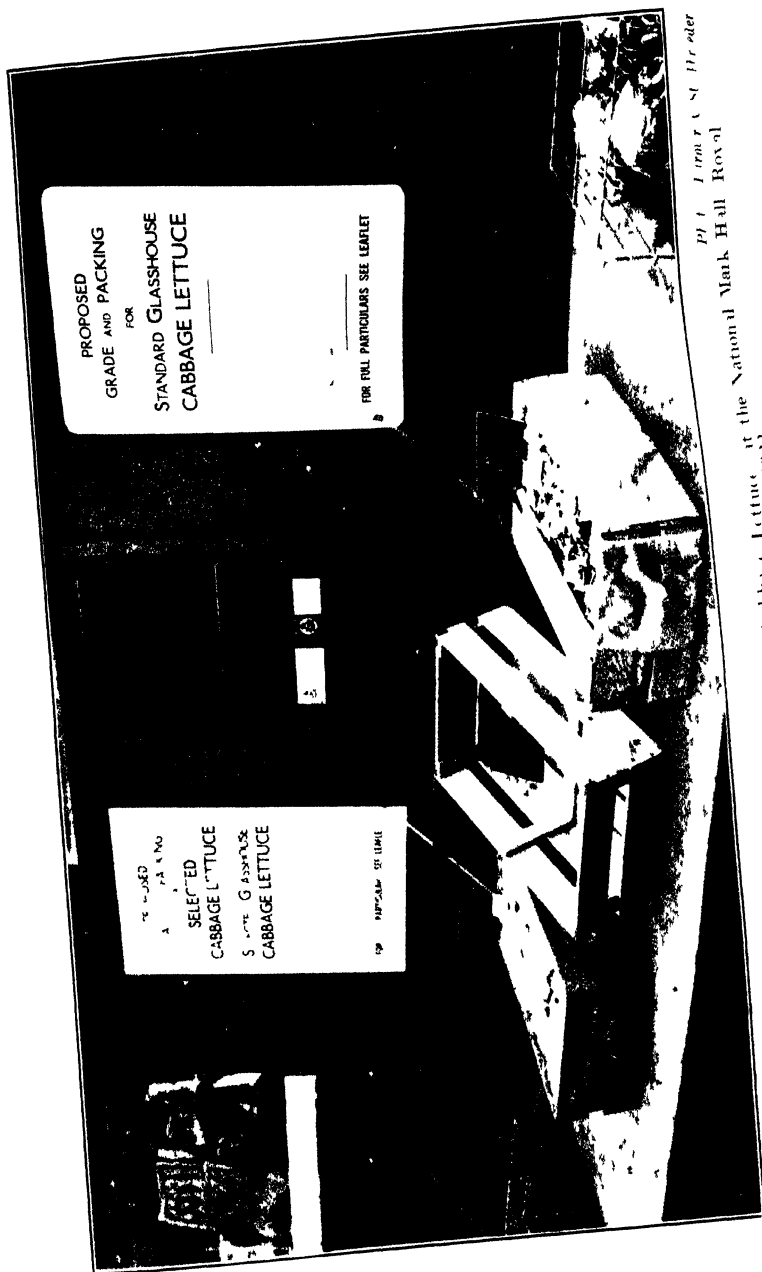
Publicity for National Mark Products.—Reference has been made in previous issues of this JOURNAL to the special lectures on the National Mark that are being given by the lecturers of the Empire Marketing Board to Women's Institutes and kindred organizations. These lectures are generally followed by discussions and by the distribution of interesting booklets relating to National Mark commodities. This form of publicity has very successfully achieved its object of interesting the consuming

public in the scheme. Officers of the Ministry have also given lectures to various bodies, dealing with the National Mark generally and the several commodities packed under it. During the past two months, a number of addresses on the National Mark has been delivered to Rotary Clubs in various parts of the country, and a further programme has been arranged. It is becoming increasingly evident that such addresses are a valuable means of publicity, and that the co-operation of the members of these clubs is assisting to create a well-informed public opinion. The Ministry welcomes the opportunity to interest such bodies in the National Mark movement, and is prepared to accept a number of invitations during the coming autumn and winter.

Marketing Demonstrations.—The summer series of marketing demonstrations at agricultural shows was brought to a conclusion with the Royal Lancashire Show at Preston (July 28 to August 1) and the Denbighshire and Flintshire Agricultural Show at Abergele (August 10). At Preston, the display included the National Mark Hall, a demonstration relating to the organization of potato marketing, and an exhibit (see illustrations facing) designed to illustrate the better marketing of cabbage lettuce. This was the first occasion on which proposals for the application of the National Mark to any vegetable have been demonstrated. The demonstration illustrated, by means of exhibits and photographs, the recommendations as to the proposed grades and packages referred to on p. 555, and included, for purposes of comparison, consignments of lettuce ungraded and roughly packed as purchased in various markets. The demonstration was repeated, with the co-operation of the Lancashire County Agricultural Committee, at the Southport Flower Show on August 24–26. It is proposed to stage a further similar demonstration—to include, in addition, a demonstration of the grading of cauliflowers—at the Imperial Fruit Show to be held at Birmingham from October 21–29.

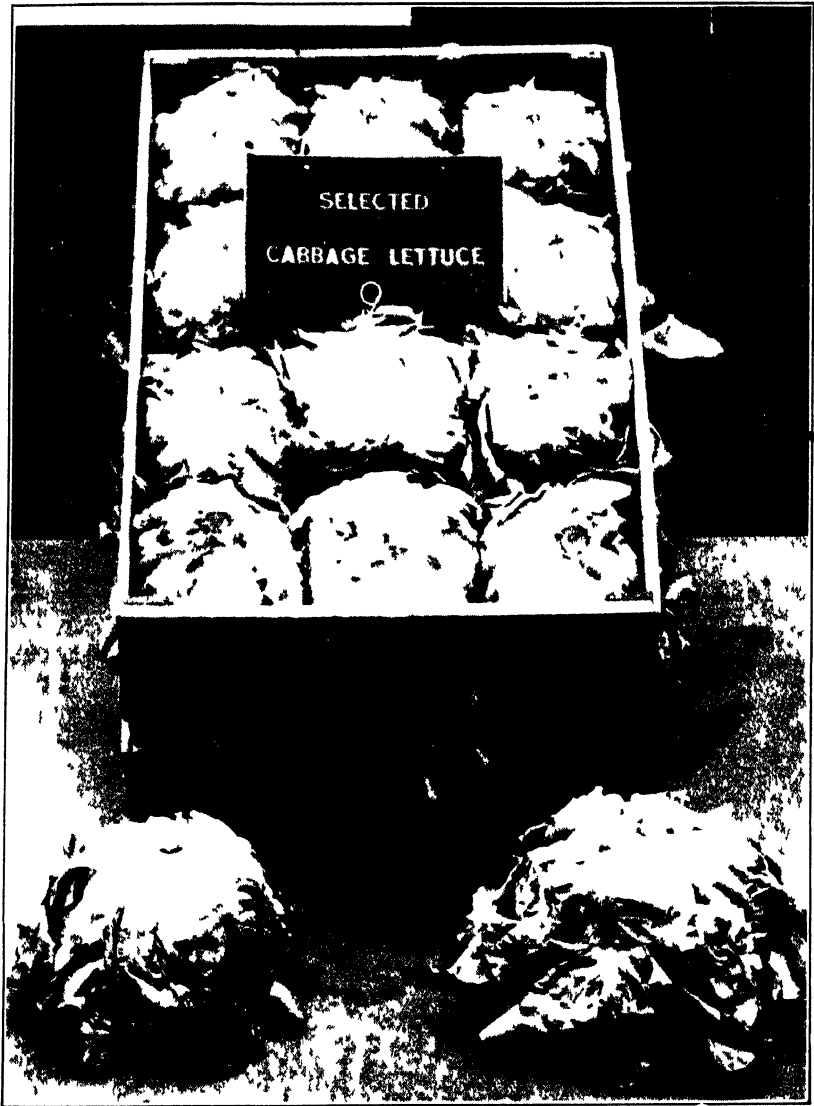
☐ Agricultural Marketing Act, 1931—Hops Marketing Scheme.—The result of the poll conducted by the Hops Marketing Board to decide whether the Hops Marketing Scheme shall remain in force was declared on August 6 as follows :—

The total number of votes recorded was 983, representing 16,470 acres, of which 924 votes, representing 14,355 acres, were in favour of the continuance of the Scheme, and 59 votes, representing 1,115 acres, were against its continuance. This is a majority of 93 per cent. in favour of the Scheme.



Display illustrating the better marketing of Cabbage Lettuce at the National Mark Hall Royal Horticultural Society Show, Preston 1932

pp. 110 & 111



(Photo Turner & Stalbreder)

Detail view of proposed grade and packing for Selected Cabbage Lettuce at
the National Mark Hall Royal Lancashire Show Preston 1932

Marketing Grants.—From time to time, grants for the improvement of marketing of agricultural produce are made by the Ministry to agricultural organizations or institutions out of funds made available by the Empire Marketing Board. An application for a grant of this nature has to be supported by evidence indicating that the work contains some novel element and that it involves a commercial risk that would not normally be accepted by the applicant. It is usually required also that the work should show prospects of becoming self-supporting within a reasonable period.

Alternatively, grants may be made in aid of specific pieces of marketing research undertaken on the Ministry's behalf or in return for certain services.

The last statement of grants made appeared in the issue of this JOURNAL for September, 1931. The following further grants were made by the Ministry during the year ended June 30, 1932 :—

<i>To whom Payable</i>	<i>Purpose</i>	<i>Amount</i>
University College of Wales, Aberystwyth.	Marketing Investigation.	*£668 10s. 0d. for academic year ending September 30, 1932.
Oxford University (Agricultural Economics Research Institute).	Investigations into marketing of farm produce.	*£647 for one year to July 31, 1933.
Shenley Poultry Products, Ltd.	To meet additional costs incurred while acting as a poultry packing demonstration centre.	*£350 for year ending August, 1932.
Welsh Department, Aberystwyth.	Expenses in connexion with the Welsh National Conference on the Breeding and Marketing of Sheep held at Aberystwyth on November 4-5, 1931.	£17 0s. 10d.
Wiltshire Egg Producers, Ltd.	To provide costings data in respect of egg packing station.	*£42 for one year to March 31, 1933.
Norfolk Egg Producers, Ltd.	Ditto	*£42 Ditto.
Gloucestershire Marketing Society, Ltd.	Ditto.	*£42 Ditto

*These are in continuation of grants previously made.

Orange Books on Marketing.—A note in the May issue of this JOURNAL pointed out that those who desired to obtain copies of certain of the Ministry's Reports on agricultural marketing should purchase them without delay, as they were expected shortly to go out of print. Since then, three of these Reports—viz., Nos. 5, 12 and 21—have been sold out. The other Report that was referred to is No. 19—*Markets and Fairs, Part III (Northern Markets)*—and orders for this volume should be sent at once to H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2., with a remittance of 9d., which will cover the cost of postage.

These "orange books" on marketing are unique; over 159,000 copies have now been sold, and in the light of the developments that are rapidly taking place in the marketing of agricultural commodities, they are indispensable to both producers and distributors. A list of the Reports may be obtained on application to the Ministry. Those published within the last few months include :—

No. 29.—Marketing of Sheep, Mutton and Lamb. (10d.)

No. 30.—Marketing of Dairy Produce, Part II (Butter and Cream). (9d.)

No. 34.—Organization of Potato Marketing. (9d.)

No. 35.—Organization of Wool Marketing. (9d.)

Beet Sugar Industry in Great Britain : 1931-32 Campaign.—

A comparative statement is given below of the results of the beet sugar manufacturing campaigns in Great Britain for the years 1930-1 and 1931-2. These figures show a great decline in the acreage under sugar beet for the year 1931-2 as compared with the previous year, but the preliminary returns for June 4, 1932, relating to the 1932-3 season show that a partial recovery has been made, the present acreage under sugar beet being about 256,000 acres.

	1931-2	1930-1
Acreage under sugar beet	234,174	348,920
Average yield per acre (tons)	7.1	8.8
Number of beet growers ..	32,897	40,415
Number of factories	18	18
Average number of days worked	64	111
Number of workers employed in factories during the campaign ..	7,900	9,900
Tonnage of beet delivered to factories	1,667,288	3,060,498
Average sugar content of beets (per cent.)	17.3	16.7
Average price paid per ton of beet ..	42s. 4d.	49s. 10d.
Estimated total sum, including cost of transport, paid by the factories to the growers	£3,529,000	£7,626,000
Total production of sugar (cwt.) ..	5,027,666	8,485,965

Average extraction of sugar expressed as a percentage of beets delivered to factories	15.1	13.9
Average extraction of sugar expressed as a percentage of total sucrose in beets	87	83
Average farm output of sucrose per acre of beet grown (lb.)	2,759	3,289
Average factory output of commercial sugar per acre of beet grown (lb.)	2,405	2,474
Production of by-products :—		
Molasses (owt.)	1,070,000*	2,124,575*
Pulp, dry (tons)	127,314	199,964
Pulp, wet (tons)	17,524	63,695
Subsidy paid :—		
Sugar	£1,632,733†	£5,512,875
Molasses	158,000*	630,312*
TOTAL	£1,790,733	£6,143,187

* Subject to adjustment.

† Excludes advances under the British Sugar Industry (Assistance) Act, 1931 ; these amounted to £183,297 and were paid on 3,085,724 owt. of sugar.

The Trade in Canned Vegetables.—The report just issued by the Empire Marketing Board (H.M. Stationery Office, 1s. net) reveals a large and growing market for canned vegetables in the United Kingdom, and indicates that there is here a large field for home and Empire enterprise.

Approximately a million cwt. of canned or bottled vegetables (more than half of them canned tomatoes) are imported annually, nearly all from Europe.

The canned pea trade is of very recent growth. Until five or six years ago, most consumers, except during the short green pea season, were dependent upon dried peas sold loose or in packets, which require much soaking and cooking to make them edible. Now there is an increasing demand both for canned fresh peas and for the home-canned processed pea, which is prepared from the dried pea.

English or Canadian packed beans are now firmly established in the catering trade, and canned peas and English packed fresh peas are gaining ground at the expense of foreign brands. Canned tomatoes used in the catering trade are almost entirely of foreign origin.

The Empire Marketing Board conducted its detailed inquiry in four areas—London, Birmingham, Liverpool and the Newcastle district. Baked beans have the largest sales in all the areas investigated except Birmingham, where tomatoes took first place. On the North-East coast, the sales of tomatoes

were also high owing to their popularity in mining districts. In London, on the other hand, the pea trade was nearly double the tomato trade, and asparagus and other canned vegetables found their best market in London.

Canada.—Quality Poultry Pays.*—The Dominion Department of Agriculture recently introduced graded dressed poultry on the market, and it is reported that dividends are being paid to producers in the form of a better demand and extra prices for a "quality" product. Consumer interest at home and buying interest abroad are being quickened as graded poultry of definite quality is offered for sale.

The demand from buyers for a graded, standardized product has become so insistent that to-day hardly a car lot of poultry moves between provinces, or a shipment for export, without being graded according to the Canadian Government standards and accompanied by a Government certificate of inspection.

A novel system has been adopted in retail trading to indicate to consumers the grade of poultry offered for sale. On the breast of each bird an attractive tag is placed, each grade-tag being designated by a distinct colour and bearing the grade name. The tags are red, blue and yellow, the red for first grade, the blue for second and the yellow for third. Consumers soon become accustomed to associate the different coloured tags with birds of the different grades and willingly pay a higher price for the better grades. In this simple way, the final link is completed in an improved marketing system.

Potato Grading in Western Australia.—In 1931, an Order in Council defining seven grades of potatoes was issued in Western Australia under the Agricultural Products Act, 1929. These grades, which apply to potatoes grown in Western Australia and intended for sale within the Commonwealth, range from "Special" to "Seed" and "Stock food."

The weight of individual tubers is taken as the basis of the grades and varies from 1½ oz. in "new potatoes" up to a range of from 6 oz. to 10 oz. in the "Special" grade. The allowance for defects on account of disease, damage, etc., ranges from 1 per cent. in the top grade to 5 per cent. in the lower grades of potatoes for culinary purposes.

Potatoes intended for sale for human consumption or for seed must be packed for transport purposes in clean bags or other approved containers marked "Potatoes" and bearing the grower's name and address.

* *Co-operation and Markets News*, Dept. of Agriculture, Regina, Sask.

The Netherlands : Measures of Assistance to the Dairy Industry.—The Crisis Dairy Act, 1932, which provides temporary relief to dairy farmers in the Netherlands, has recently been passed. The Act makes provision for the compulsory use of a prescribed proportion of home-produced butter in all margarine for domestic consumption*—described as margarine "A," as distinct from margarine "B" which is intended for export and need not contain butter.

Statutory regulations have been issued prescribing that margarine "A" shall contain a minimum of 25 per cent. of home-produced butter; it is anticipated that this will reduce the exportable surplus of butter, which has to be sold at world prices, and will help to maintain the existing price ratio between margarine and butter, thus reducing the risk of a substitutional change in demand from butter to margarine in the event of a rise in the price of the former.

Levies have been imposed on all butter for domestic consumption and on margarine "B," and these levies are to be collected by enforcing the use of marks or labels, the charges for which have been fixed at 42 cents per kg. for butter and 20 cents per kg. for margarine "B." Imports of butter, margarine and edible fats (except those for use in margarine production) are prohibited unless they are accompanied by a transport permit, the charge for which is to be fixed by the Minister for Agriculture at a figure calculated to absorb as far as possible the difference between the value of the goods in the Netherlands and their value on the world markets. It is also proposed that levies shall be imposed upon the cheese industry.

The proceeds from these various sources are to be paid into a central fund and used to make compensatory payments to producers and others who export butter at prices lower than those obtainable in the domestic market. The enhanced butter values will, in turn, enable milk producers to receive a guaranteed minimum price for their milk.

The Act is to be administered by a Crisis Dairy Central, or Council, consisting of a chairman who is a Government Commissioner, and not more than fifteen other members appointed by the Minister for Agriculture but representative of the various interested parties, including a representative of consumers.

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* A similar plan is in operation in Norway : see *Report on the Marketing of Dairy Produce in England and Wales, Part II : Butter and Cream* (Economic Series No. 30), p. 88.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1932

ACREAGE UNDER CROPS AND GRASS AND NUMBERS OF LIVE STOCK ON HOLDINGS ABOVE ONE ACRE IN EXTENT IN ENGLAND AND WALES AS RETURNED BY OCCUPIERS ON JUNE 4, 1932.

(The figures for 1932 are subject to revision.)

CROPS AND GRASS

Distribution	1932	1931	Increase		Decrease	
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Per cent.</i>	<i>Acres</i>	<i>Per cent.</i>
TOTAL ACREAGE under all CROPS and GRASS ..	25,199,000	25,283,000	—	—	84,000	0.3
*ROUGH GRAZINGS ..	5,356,000	5,316,000	40,000	0.8	—	—
ARABLE LAND ..	9,362,000	9,582,000	—	—	220,000	2.3
PERMANENT GRASS :						
For Hay ..	4,546,000	4,778,000	—	—	232,000	4.9
Not for Hay ..	11,291,000	10,923,000	368,000	3.4	—	—
TOTAL ..	15,837,000	15,701,000	136,000	0.9	—	—
Wheat	1,288,000	1,197,000	91,000	7.6	—	—
Barley	963,000	1,029,000	—	—	66,000	6.4
Oats	1,577,000	1,652,000	—	—	75,000	4.5
Mixed Corn ..	114,200	121,900	—	—	7,700	6.3
Rye	24,700	32,500	—	—	7,800	24.0
Beans, harvested as corn ..	139,000	145,000	—	—	6,000	4.1
Beans, picked or out green ..	14,400	13,200	1,200	9.1	—	—
Peas, harvested as corn ..	65,900	74,900	—	—	9,000	12.0
Peas, picked or out green ..	60,800	57,500	3,300	5.7	—	—
Potatoes ..	503,700	446,800	56,900	12.7	—	—
Turnips & Swedes	579,400	621,000	—	—	41,600	6.7
Mangold ..	229,800	270,700	—	—	40,900	15.1
Sugar Beet ..	254,800	233,200	21,600	9.3	—	—
Cabbage for fodder, Kohl-rabi and Rape ..	109,400	125,700	—	—	16,300	13.0
Vetches or Tares	48,600	64,200	—	—	15,600	24.3
Lucerne ..	39,400	46,200	—	—	6,800	14.7
Mustard for seed	20,200	22,600	—	—	2,400	10.6
Cabbage for human consumption ..	33,900	35,700	—	—	1,800	5.0
Brussels Sprouts	32,900	35,600	—	—	2,700	7.6

* Mountain, Heath, Moor, Down and other rough land used for grazing.

CROPS AND GRASS—*continued*

Distribution	1932	1931	Increase		Decrease	
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Per cent.</i>	<i>Acres</i>	<i>Per cent.</i>
Cauliflower or Broccoli ..	17,600	15,800	1,800	11.4	—	—
Carrots ..	12,500	9,400	3,100	33.0	—	—
Onions ..	1,900	1,500	400	26.7	—	—
Celery ..	7,700	7,300	400	5.5	—	—
Rhubarb ..	8,300	7,800	500	6.4	—	—
Linseed ..	1,400	3,200	—	—	1,800	56.3
Hops ..	16,600	19,500	—	—	2,900	14.9
Small Fruit ..	59,400	62,000	—	—	2,600	4.2
Orchards ..	247,100	244,800	2,300	0.9	—	—
CLOVER and ROTATION GRASSES:						
For Hay ..	1,538,000	1,726,000	—	—	188,000	10.9
Not for Hay ..	873,000	855,000	18,000	2.1	—	—
TOTAL ..	2,411,000	2,581,000	—	—	170,000	6.6
BARE FALLOW ..	433,000	357,000	76,000	21.3	—	—

The total agricultural area covered by the returns made as on June 4, 1932, by occupiers of holdings exceeding one acre in England and Wales was 30,555,000 acres, and shows a further net reduction since June, 1931, of 44,000 acres. The area under crops and grass was 25,199,000 acres, or 84,000 acres less than last year, while the area returned as rough grazings increased by 40,000 acres to 5,356,000 acres. The arable acreage amounted to 9,362,000 acres, or 220,000 acres less than in the preceding year, this decrease being about 30,000 acres less than that shown in 1931. Of the arable acreage 433,000 acres were returned as bare fallow, this area showing an increase of 76,000 acres as compared with the previous year. The area actually under crops (excluding clover and rotation grasses) was thus 126,000 acres less than in 1931. An increase of 136,000 acres brought the area under permanent grass to 15,837,000 acres.

There was a reduction of 80,500 acres in the total area under corn crops (including beans and peas harvested as corn), a substantial increase in the wheat acreage being outbalanced by the combined decreases in all other corn crops. The potato acreage was increased by nearly 13 per cent., and while some recovery was shown in the area under sugar beet, which suffered a 33 per cent. reduction in 1931, the acreage under roots and other fodder crops was appreciably smaller. The total area under vegetables was larger than in 1931, and while the orchard acreage showed a small increase, the area devoted to small fruit was reduced. With the exception of that recorded in 1918 the hop acreage returned this year was the lowest on record.

Cereals.—The wheat acreage was 1,288,000 acres, or 91,000 acres (7.6 per cent.) more than in 1931. While increased acreages were general throughout the country (negligible decreases being shown in only four counties) nearly 60 per cent. of the total increase was contributed by the Eastern and North-Eastern divisions.

The acreage under barley was smaller than in 1931 by 66,000 acres (6·4 per cent.), and the total area at 963,000 acres was the lowest on record. While most counties in the North-Western and South-Western divisions returned increased acreages under barley, decreases were very general throughout the country. The Eastern and North-Eastern divisions suffered a combined loss of about 54,000 acres, which approximates very closely to the extension of the wheat acreage in these two divisions.

Oats were grown on the smallest area recorded for this crop, the total acreage returned this year being 1,577,000 acres, or 75,000 acres (4·5 per cent.) less than in 1931. The only increases of note were about 4,000 acres in Yorkshire and 2,000 acres in Norfolk. Otherwise decreases were general throughout the country. The Eastern and South-Western divisions each lost about 17,000 acres, and the two Midland divisions about 12,000 acres each, these decreases ranging from 8 to 10 per cent. of the acreages returned last year in these divisions.

The area under mixed corn was 114,200 acres, or 7,700 acres (6·3 per cent.) less than in 1931, and whereas the South-Western division, where this crop is most largely grown, showed a not increase in acreage, the great majority of counties outside this division returned reduced acreages.

The rye acreage was 24,700 acres, which shows a reduction of 7,800 acres (24 per cent.) since 1931, and is the lowest recorded for this crop.

Beans and Peas.—The total area under beans was 153,000 acres as compared with 158,000 acres in 1931. There was a decrease of 6,000 acres (4·1 per cent.) in the area to be harvested as corn, but an increase of 1,200 acres (9·1 per cent.) in the area to be picked green. The greatest reductions in the acreage under beans were shown in the Eastern, East Midland, and South-Western divisions, which lost about 4,000 acres, 2,000 acres, and 1,000 acres respectively, while there were increases of 1,300 acres and 800 acres in the North-Eastern and Northern divisions respectively. The acreage returned as under peas amounted to 127,000 acres, or 5,700 acres less than last year. This reduction is due to a decrease of 9,000 acres (12 per cent.) in the area to be harvested as corn, which was only partially balanced by an increase of 3,300 acres (5·7 per cent.) in the area to be picked green.

Potatoes.—The acreage under potatoes, which showed an increase of 22,000 acres, in 1931 was further expanded in 1932 by 56,900 acres. The total acreage returned this year was 503,700 acres, the increase as compared with last year being 12·7 per cent. Every county in England and Wales showed an increase in acreage under potatoes, Lincolnshire alone showing an addition of over 9,000 acres, while Essex increased its acreage by over 4,000 acres, and the Isle of Ely and Kent each by over 3,000 acres. In each of the Eastern and North-Eastern divisions there was an increase of about 13,000 acres, representing 17 and 9 per cent. respectively, while in the Northern and North-Western divisions increases of 3,000 acres and 10,000 acres were equivalent to 6 per cent. and 13 per cent. respectively.

Sugar Beet.—There was an appreciable recovery in the sugar beet acreage which in 1931 showed a reduction of nearly 33 per cent. The area under this crop was returned this year at a total of 254,800 acres or 21,600 acres (9·3 per cent.) more than in 1931. In the North-Eastern and Eastern divisions, which provide over 80 per cent. of the acreage under this crop, there were net increases of 17,000 acres and 10,000 acres respectively, and while increases were shown by several counties in the latter division, in the North-Eastern division only Norfolk returned an increased acreage, the addition being as much as 24,000 acres.

Fodder Roots.—Turnips and swedes were grown on 579,400 acres as compared with 621,000 acres in 1931, the decrease being 41,600 acres (6·7 per cent.). Except for small increases in a few counties the reduction was general throughout the country. The greatest reductions were 11,000 acres in Norfolk; 6,000 acres in Lincolnshire; and 4,400 acres in Yorkshire. The area under mangolds was 229,800 acres, which was 40,900 acres (15·1 per cent.) less than in 1931. Every county contributed to this decrease, the most marked reductions being 7,000 acres in Norfolk and about 3,000 acres in Yorkshire and Suffolk.

Vegetables.—With the exception of cabbage and brussels sprouts all vegetables for which returns were collected were grown on increased acreages this year. Cauliflower and broccoli increased by 1,800 acres (11·4 per cent.) to 17,600 acres; carrots by 3,100 acres (33 per cent.) to 12,500 acres; onions by 400 acres (26·7 per cent.) to 1,900 acres; and celery and rhubarb by 400 acres and 500 acres to 7,700 acres and 8,300 acres respectively. Cabbage for human consumption on 33,900 acres showed a reduction of 1,800 acres (5 per cent.), while the acreage under brussels sprouts was reduced from 35,600 acres to 32,900 acres, a decrease of 2,700 acres (7·6 per cent.).

Other Crops.—The area under fodder cabbage, kohlrabi and rape was reduced by 16,300 acres to 109,400 acres, and that under vetches and tares by 15,600 acres to 48,600 acres. The area under lucerne decreased by 6,800 acres to 39,400 acres, and that under mustard for seed by 2,400 acres to 20,200 acres. The hop acreage at 16,600 acres shows a reduction of 2,900 acres (14·9 per cent.) compared with that of 1931, the decrease being practically confined to the South-Eastern area, Kent alone showing a loss of 2,400 acres.

Fruit.—The total fruit acreage this year shows a net fall of only 300 acres. Actually there was a loss of 2,600 acres in the acreage under small fruit, which was almost balanced by an increase in the orchard acreage of 2,300 acres. The additional orchard acreage was mainly contributed by Kent, which showed an increase of over 1,000 acres; Worcester, 600 acres; and Norfolk, 700 acres. Reductions in the acreage devoted to small fruit were fairly general throughout the country, but most noticeable in Norfolk and Kent.

Clover and Rotation Grasses and Meadow Hay.—As compared with 1931 there was a decrease of 170,000 acres in the total area under clover and rotation grasses, which was 2,411,000 acres. Of this total area 1,538,000 acres were returned as intended for hay, this figure showing a reduction of 188,000 acres as compared with 1931, while 873,000 acres not intended for mowing represent an increase of 18,000 acres.

The acreage of meadow hay was returned as 4,546,000 acres, or 232,000 acres less than in 1931, and the total area intended for hay this year amounted, therefore, to 6,084,000 acres, which shows a reduction of 420,000 acres as compared with that of last year.

Bare Fallow.—Land returned as bare fallow amounted to 433,000 acres as compared with 357,000 acres in 1931; the increase of 76,000 acres being equivalent to 21·3 per cent.

LIVE STOCK

The numbers of live stock which with the exception of horses showed general increases in 1931 have been further augmented this year. The total number of cattle shows an increase of 4·8 per cent. Sheep have increased by 4·1 per cent., while pigs, which last year showed an addition of over 20 per cent., have increased since 1931 by 14·3 per cent.

CATTLE

	1932	1931	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Cows and Heifers in milk ..	2,116,000	2,043,100	72,900	3·6	—	—
Cows in calf, but not in milk ..	351,900	321,700	30,200	9·4	—	—
Heifers in calf ..	402,500	425,300	—	—	22,800	5·4
Other Cattle :—						
Two years and above ..	938,900	936,200	2,700	0·3	—	—
One year and under two ..	1,241,100	1,130,400	110,700	9·8	—	—
Under one year	1,305,200	1,208,300	96,900	8·0	—	—
TOTAL OF CATTLE	6,355,600	6,065,000	290,600	4·8	—	—

The addition of 290,600 to the total number of cattle returned in 1931 makes the figure for 1932 the highest so far recorded. The same record has been established in regard to the dairy herd, which shows a net increase of over 80,000. Cows and heifers in milk increased by 72,900, or 3·6 per cent., while cows in calf increased by 30,200, or 9·4 per cent. Against these increases there was a decrease of 22,800, or 5·4 per cent., in the number of heifers in calf. The increase in the number of dairy cattle was shared by practically every county in England and with trifling exceptions in Wales. Increases in the various divisions ranged from 1·5 per cent. in South Wales to 4 per cent. in the South-Eastern division. Among "other cattle" the greatest increase was that of 110,700, or 9·8 per cent., in cattle one year old and under two, although in cattle under one year there was an almost equal increase of 96,900, or 8 per cent. The number of cattle two years and above showed little variation from last year, the increase recorded being 2,700, or only 0·3 per cent. Increases in the number of "other cattle" under two years old were shared by almost every county; in the case of the older cattle, however, the majority of counties in England showed reductions in the number of cattle in this class, but all Welsh counties recorded an increase.

SHEEP

	1932	1931	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Ewes kept for breeding ..	7,623,800	7,262,500	361,300	5·0	—	—
Other Sheep :—						
One year and above ..	2,967,600	2,783,800	183,800	6·6	—	—
Under one year	7,887,200	7,702,900	184,300	2·4	—	—
TOTAL OF SHEEP	18,478,600	17,749,200	729,400	4·1	—	—

The total number of sheep returned this year is higher than in any year since 1911, although the increase shown since 1931 is only about one half that recorded last year. The heaviest increase is that of 361,300, or 5 per cent., in the number of breeding ewes. "Other Sheep" both over and under one year show increases of about 184,000 being equivalent to 6.6 per cent. in the case of older sheep and 2.4 per cent. in the case of lambs. While all counties except two in Wales contributed to the increase in the number of breeding ewes, there was very much less uniformity in the changes in the number of other sheep. The greatest increases in the number of breeding ewes were in the East Midland division where an addition of 80,000 was equivalent to nearly 15 per cent.; West Midland division, with an increase of 52,000, or 7 per cent.; South-Eastern division, an increase of 49,000, or 9 per cent.; North-Eastern, 42,000, or 8 per cent.; and Eastern division 39,000, or nearly 15 per cent. In the case of other sheep there was an increase in the great majority of counties in all divisions except the North-Eastern division, where every county shared in a decrease of 32,000. The increase in the number of lambs occurred mainly in the Eastern, Midland and Southern areas of the country, where practically every county showed appreciable additions. In the two Northern divisions, in the South-Western division and in Wales there were net decreases in the numbers of lambs.

PIGS

	1932	1931	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Sows kept for breeding ..	424,500	402,400	22,100	5.5	—	—
Other Pigs ..	2,756,500	2,380,600	375,900	15.8	—	—
TOTAL OF PIGS..	3,181,000	2,783,000	398,000	14.3	—	—

The total number of pigs on agricultural holdings in June, 1932, was greater than in any year on record with the exception of 1924 when the total was higher by about 47,000. The increase shown this year as compared with 1931 was mainly in "other pigs" which were greater by 375,900 or 15.8 per cent. while breeding sows showed an increase of 22,100 or 5.5 per cent. The increase in the number of breeding sows was appreciably less than that shown in 1931 which was 85,900 or 27.2 per cent. Increases in this class of pigs were shown by practically all counties except in Wales and the two Northern divisions, where most counties shared in the net decreases shown by each of these divisions. Only one division, North Wales, showed a decrease in the total number of other pigs, and this was negligible. Otherwise practically every county contributed to the increase.

HORSES

Although the number of horses on agricultural holdings has declined each year since 1921 the latest returns again show a slackening in the rate of decrease. The net decrease as compared with 1931 was 21,900 or 2.3 per cent. as compared with 22,900 (2.4 per cent.) shown last year. The number of horses used for agricultural purposes shows a reduction of 11,900 (1.8 per cent.) as compared with a reduction of 16,300 (2.4 per cent.) in 1931. The most noteworthy feature, however, is the increase in the number of foals which, with the

	1932	1931	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Horses used for Agricultural purposes (including Mares for breeding) ..	654,600	666,500	—	—	11,900	1·8
Unbroken Horses (including Stallions):—						
One year and above ..	85,300	85,200	100	0·1	—	—
Under one year ..	39,100	37,800	1,300	3·4	—	—
Other Horses ..	137,600	149,000	—	—	11,400	7·7
TOTAL OF HORSES	916,600	938,500	—	—	21,900	2·3

exception of a small addition in 1930, has shown a decline each year since 1919.

AGRICULTURAL WORKERS

	1932	1931	Increase		Decrease	
	No.	No.	No.	Per cent.	No.	Per cent.
Regular Male Workers:—						
21 years old and over	419,400	435,000	—	—	15,600	3·6
Under 21 years old	115,600	116,900	—	—	1,300	1·1
TOTAL ..	535,000	551,900	—	—	16,900	3·1
Casual Male Workers:—						
21 years old and over	64,600	62,300	2,300	3·7	—	—
Under 21 years old	9,300	9,300	—	—	—	—
TOTAL ..	73,900	71,600	2,300	3·2	—	—
TOTAL MALE WORKERS, REGULAR & CASUAL	608,900	623,500	—	—	14,600	2·3
Women & Girls:						
Regular workers	62,200	64,400	—	—	2,200	3·4
Casual workers	26,000	28,700	—	—	2,700	9·4
TOTAL ..	88,200	93,100	—	—	4,900	5·3
TOTAL WORKERS, ALL CLASSES ..	697,100	716,600	—	—	19,500	2·7

The total number of agricultural workers shows a further decline, but the rate of decrease has again slackened as compared with the previous year. The decrease in the total number is 19,500 (2·7 per cent.) as compared with 25,200 (3·4 per cent.) in 1931. Reductions were shown in all classes except casual adult male workers where there was an addition of 2,300 (3·7 per cent.). The decrease in the number of regular male workers was rather greater than last year, and is more pronounced in the number of adult workers than in youths. Female workers also show a greater reduction which was mainly in regular workers.

HOPS

Acreage of Hops.—Preliminary statement compiled from the returns collected on June 4, 1932, showing the acreage under Hops in each county of England in which Hops were grown, with a comparative statement for the years 1931 and 1930.

Counties, etc.					1932	1931	1930
					Acres	Acres	Acres
Kent ..	{	East.. ..	..	..	1,920	2,556	2,685
		Mid .. ..	..	..	2,650	3,550	3,606
		Weald .. ..	..	..	4,490	5,388	5,529
	Total, Kent ..				9,060	11,494	11,820
Hants ..	..	..	..	..	520	751	867
Hereford ..	..	..	..	..	3,860	3,817	3,688
Surrey ..	..	..	..	..	80	146	140
Sussex ..	..	..	..	..	1,180	1,453	1,680
Worcester ..	..	..	..	..	1,830	1,811	1,732
Other Counties ..	..	..	..	..	70	56	70
TOTAL					16,600	19,528*	19,997*

* These figures include the acreage left unpicked which was estimated in 1931 to be about 1,600 acres and in 1930 about 3,400 acres.

SEPTEMBER ON THE FARM

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Corn Harvest and the Weather.—In the south of England the corn harvest of 1932 will be noted for commencing very late and for the exceptionally badly-laid and twisted condition of many of the autumn-sown crops. Farmers are well used to winter oats, particularly the Grey Winter variety, being lodged and difficult to harvest, but wheat this year suffered to a greater extent than within living memory. Cutting by hand, either with hook or scythe, is expensive work, and few men are available who have enough experience to get through it.

The binder was forced to do the work, but not without delays and breakages. The ground was soft and where horses were used the work proceeded slowly. Where a tractor was used to haul the binder, the strain was such as to find out the weak parts, and breakages were frequent. If seasons were uniform from year to year, something could be done to alleviate the trouble, and at the moment the farmer has it in mind to be less liberal with manures another year.

The circumstances, however, have been quite abnormal, and the rainfall at Chichester between October 1, 1931, and August 1, 1932, may be taken as indicating what happened over a wide area in the south of England. The winter rainfall was exceptionally small and it was consequently likely that much less of the soil nitrogen was washed away during winter, but remained to benefit the crops. The exceptional rain during May, when growth was most rapid, then produced heavy crops with soft straw, and a fall of half-an-inch of rain on June 3 laid many of the crops, while a further fall of an inch of rain on June 30 added materially to the damage.

The abnormality of the rainfall is shown in the records taken at Chichester. During the three months ending December 31, 1931, the total rainfall was 5·34 in. as compared with an average of 12·63 in. during the same period for the previous five years. In January, February and March, 1932, the rainfall was 4·70 in. as compared with an average of 7·14 in. during the same period for the previous five years. The total winter rainfall was thus only 10·04 in. as compared with a five-year average of 19·77 in. The rainfall during April was 2·55 in., which is about normal for the district, but May produced 4·86 in. as compared with a five-year average of 1·93 in. June was normal as regards total amount, the figures recorded being 1·83 in., but

of this amount 0.53 in. fell on June 3 and 1.01 in. on June 30. The fall on June 30 saved the month from being recorded as dry below average. July proved exceptional as being very wet, the total rainfall being 4.11 in., of which 2.38 in. fell between July 22 and 26. The average for the previous five years was 2.45 in.

Such a complete reversal of the usual incidence of rainfall has resulted in particularly good crops of autumn-sown grain, but unfortunately these were much spoiled before harvest; spring-sown grain crops, on the other hand, have fared indifferently. Root crops have derived partial benefit from the rains, especially on the lighter soils, but weed growth has been abundant and expensive to destroy.

Grass land, however, has produced abundant herbage, and as this is the second relatively wet summer in succession the stock-carrying capacity of the grass land in the south has been unduly high—much above what is normally experienced.

Surveys of Farming Methods.—In recent years, surveys by several of the Economic Research Departments attached to Universities and Colleges, have set out various details of what has happened with regard to the production of crops, live stock and live stock products.

Much interest has been aroused by these reports, but it is difficult for the ordinary farmer to get from them information that can be of immediate benefit to him. The farmer is more interested in any report that sets out more or less in detail the methods adopted by a successful farmer. The wider survey, however, is valuable, and while each system can be valuable in itself the greatest value will result from a study of both types of report.

It is not possible to generalize where there are so many variable factors. Land, climate, equipment, size of farm, facilities for transport and markets, as well as the individual capacity of the farmer, are all so variable. What the surveys appear to indicate is that there are certain factors that influence the economic results. In the case of the large arable farmer the labour costs on the expenditure side and the price of grain on the income side can materially alter the economic aspect, and it is difficult for him to adjust these to the circumstances of a particular time. Grain is to him an end product of a scheme that has taken a long time to complete. He cannot influence the market, and when faced with low prices his choice must be between producing more grain with the same labour costs or the same grain with less labour costs.

On very many well managed farms the production has already been stressed to its utmost economic limit, and there has been no alternative but to reduce labour costs. This is happening ; a decline in the standard of cultivation can be noted, where cultivations are less thorough, hedges are neglected, ditches are not regularly cleaned out, and less weeding is done. At first the saving effected may be justified in that the crops have not been reduced in value to the like extent. Sooner or later, however, this inefficient cultivation will have its effect : crops will suffer and the expense of putting the land in order will be greater than the saving. Taking a reasonably long view it will not be a wise policy to maintain arable land in cultivation unless it is done well. If it fails to be remunerative as arable land when well done, the alternative is longer rotations or laying down to grass—or at the worst the land will become derelict.

The live stock farmer's problem is more complex, particularly when combined with arable farming. The aim is to cheapen production per unit of the produce sold or to increase the number of units sold.

In extensive production, such as is practised in the keeping of sheep in hill districts, rent and labour are the chief items of expenditure, but under intensive conditions food is the most important item. Usually food is partly produced on the farm and partly purchased, and there is considerable scope for the efficient farmer in producing suitable crops for stock feeding and so reducing the bill for feeding stuffs. There has been much stress laid on feeding for maximum production and the necessity for balancing rations. It may be heresy to say so, but there are many instances where the feeding of foods produced on the farm, even if they are not theoretically balanced, is justified by economic results. Such problems can be solved only by the individual who studies his own conditions, but he can get material help from surveys that set out costs of production under different circumstances and the methods by which successful farmers attain their object.

Autumn Cultivations.—One of the difficulties of a late and prolonged harvest is the delay caused to work that should be done in early autumn. In the south of England a catch crop of turnips sown broadcast often produces a bulk of very acceptable sheep feed in early spring, when it can be cleaned off in time to sow mangolds or sugar beet.

The success of such a practice is dependent on a fairly early harvest and quick and effective cultivation of the land to

ensure a good tilth and avoid loss of moisture. A more reliable crop for autumn sowing for use in spring, prior to sowing mangolds, is rye ; for this crop, cultivation is easier and a single ploughing may be all that is necessary to ensure a satisfactory crop.

Another crop of importance, mainly in the south, is Crimson Clover (*Trifolium incarnatum*) commonly referred to as trifolium. Several varieties are available and are usually classed in their order of maturity as Early Red, Late Red and Late White. This plant does not require much cultivation, and as it prefers a firm seedbed ploughing is not advisable. The best preparation is usually by harrowing only, to secure a tilth to germinate the seed, but without disturbing more than an inch of soil. It is important to sow this crop as soon as possible after harvest. It does not arrive at maturity until about the middle of May and consequently by the time it is fed off it is too late to sow mangolds, but swedes, turnips, or rape are suitable.

This crop is going out of favour. At one time, on farms where the grass land was limited, it was relied upon as the first green food that could be cut for horses or cattle indoors, and folded by sheep outside in the time between the feeding off of rye or barley and the autumn-sown tares.

Now that more grass land is available and there are fewer arable land sheep the practice of catch-cropping is at the moment on the decline.

Intensive versus Extensive Methods.—Catch-cropping is a feature of the most intensive use of arable land, and in times of remunerative prices for grain and live stock and their products it could be amply justified ; it then resulted in high production, since it necessitated more cultivations and more stock to produce and consume the extra crop, and this procedure in turn was reflected in the higher fertility of the farm.

The tendency at the present time is to vary production methods in an extensive direction as opposed to the intensive methods commonly associated with corn and sheep farming. In some degree the extensive methods are succeeding by utilizing the accumulated fertility of the past, but it is open to doubt how long such fertility will continue to produce crops that might be expected in normal times to meet even the reduced costs of the less extensive methods.

In this respect the small farmer is in a different position from the large farmer. On the small farm extensive methods are not

possible, and to maintain a high turnover it is more or less necessary to adopt intensive methods. Such methods may be the cultivation of crops under glass, flower growing, or market gardening or fruit culture, with possible combinations of any or all such crops. On other moderately small units intensive methods of live stock husbandry may be the solution. When it is managed on sound business lines poultry keeping has succeeded in recent years and has proved relatively profitable.

Pig keeping is experiencing one of the severe depressions to which this branch of live stock is subject from time to time. It is often said that pigs are either copper or gold : at present they are hardly as good as copper.

Milk production is also suitable for the small producer, as, so long as the unit is big enough to utilize fully the labour employed, large scale production has few advantages that are not offset by the disadvantages.

Corn and sheep and to some extent beef production are the prerogative of the comparatively large farm. On good land intensive production may be the most desirable method, but on inferior land extensive methods may offer much better chances of profitable production.

On the larger farms managerial ability, particularly where a large amount of labour is employed, may be more important than the type of farming that is practised.

Where live stock are concerned the individual with knowledge and good judgment, either as a breeder or purchaser of stock, will succeed where his less qualified neighbour might fail.

* * * * *

PRICES OF ARTIFICIAL MANURES

Average prices per ton during week
ended August 10

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	9 0	9 0	9 0	9 0	11 7
" " Granulated (N. 16%) ..	9 0	9 0	9 0	9 0	11 3
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	5 5d	5 5d	5 5d	5 5d	5 1
Calcium cyanamide (N. 20·6%)	6 15e	6 15e	6 15e	6 15e	6 7
Kainit (Pot. 14%) ..	3 3	2 19	2 18	3 3g	4 6
Potash salts (Pot. 30%) ..	5 2	4 19	4 19	5 2g	3 5
" (Pot. 20%) ..	3 12	3 8	3 8	3 13g	3 8
Muriate of potash (Pot. 50%) ..	9 9	9 4	8 17	9 7g	3 8
Sulphate " (Pot. 48%) ..	11 6	11 0	10 16	11 5g	4 8
Basic slag (P.A. 15½%)|| ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)|| ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock-phosphate (P.A. 26·27½%)|| ..	2 10a	..	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%) ..	3 2	..	3 5	2 16k	3 6
" (S.P.A. 13½%) ..	2 17	2 9	3 0	2 12k	3 10
Bone meal (N.3½%, P.A.20½%) ..	8 15	6 15	7 10	5 17	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 19b	5 2f	6 0	4 15	..

Abbreviations : N. = Nitrogen ; P.A. = Phosphoric Acid ; S.P.A. = Soluble Phosphoric Acid ; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

§ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2s. 6d. extra.

b Delivered (within a limited area) at purchaser's nearest railway station.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

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The Feeding of Ewes—"Flushing" in Relation to Health.—

In these Notes for September, 1931, the writer discussed the "flushing" of ewes. By "flushing" is meant the practice of changing ewes to a higher plane of nutrition immediately before and at the time of tupping, in order that multiple ovulations may be encouraged. Multiple ovulations mean that two or more ova or eggs are produced at the time of "heat." If these ova are duly fertilized then a larger proportion of the ewes will become pregnant with twins, or triplets, and will in due course give birth to a higher percentage of lambs. Observations made by Marshall and others showed definitely that more lambs are actually produced when ewes are "flushed," and fed more liberally, or on more nutritious food, before or at the time of mating. In practice, the object has been to have the ewes in good and improving condition at the time at which they are "tupped."

It is, however, desirable that ewes that have been definitely flushed and got into really good form at tupping time should not be allowed to go back in condition by being subjected to hard conditions. Before deliberately flushing his ewes the flockmaster should be sure that he can keep them, throughout pregnancy, in reasonably good condition, without allowing them to "go back" too much before lambing time, otherwise there may be risk of danger to health.

This season there should not be much difficulty in bringing ewes to the tup in "good" condition. It will be more difficult to ensure that they are in "improving" condition. Grass is generally plentiful. Aftermaths are fresh and provide good keep for sheep. The trouble has been to prevent thrifty grassland ewes of the "Half-Bred" type from getting too fat, particularly where their lambs were sold as early fat lamb. Wherever possible it is advisable to keep dry ewes, between weaning and tupping, on a healthy but poorer class of grazing in order to prevent their becoming over fat.

Dorset Horn ewes served to lamb in September, October and November should come to lambing in good form in September, in any case. Such ewes on this farm have improved steadily in condition on grass since brought from Dorset at the end of May, and trough feeding should not be necessary except to provide a small quantity of dry food for three weeks or a fortnight before lambing. The allowance of $\frac{1}{2}$ to $\frac{3}{4}$ lb. of concentrate per day before lambing does seem to be

refunded by the way ewes milk and maintain condition after lambing, even though previously they are apparently perfectly fit, as far as the eye can judge, on grass alone.

Where it is considered necessary to provide concentrated food for "flushing" purposes, it may be worth while to recall that a mixture supplying a fair amount of protein has been considered to be generally satisfactory. Such mixtures are: (1) equal parts by weight of decorticated ground nut cake, undecorticated cotton cake, and either crushed oats or flaked maize or maize germ meal; (2) three parts crushed beans or peas, and two parts crushed oats; (3) two parts maize gluten feed, one part crushed oats, one part bran.

Pig-Feeding Experiments.—An account of the experiments on pig-feeding, conducted by Dr. Crowther and his assistants at Harper Adams Agricultural College, for the years 1926-31, has been published in the Journal of the R.A.S.E., 1932, and reprinted in the form of a bulletin as "Pig-Feeding Report, No. 1." It is not intended to discuss here the whole of the results which have been published, but the attention of those interested in pig-feeding may well be directed to this Report, as it will repay careful study, providing much information of a kind that can be applied advantageously by the practical pig-feeder.

At the outset, Dr. Crowther draws attention to the normal variation in growth which may occur within groups of pigs. Assuming that the pigs bred at the College were all pure-bred Large Whites, even with these pure-bred animals appreciable differences occurred—necessitating an allowance of fully 10 per cent. for normal variation. This point regarding variation in the rate of growth should be carefully noted by those carrying out experiments, as it is not always sufficiently appreciated.

The amount of the variation in rate of growth occurring in these Large Whites is not unexpected. Variation within the breed is considerable, not only in respect of growth, but as regards other economic points as well. In June, 1931, a system of recording the weights of litters at three weeks old was started in the newly established herd of Large Whites at this Farm Institute. The foundation sows had been drawn from several different sources, and the weights of healthy litters have varied within wide limits, namely, from 63 lb., for a litter of 7, to 136 lb. for a litter of 11, at the age of 21 days. Putting this in another way, the piglets in the litter of 7 averaged 9 lb. each, whereas those in the litter of 11 averaged 12.3 lb. each at the same age. The weight at three weeks old is held to provide

a fair measure of the sow's capacity to milk, and of the piglets' ability to thrive.

The summary of the growth records, given in the Report, serves as an excellent guide to the pig-keeper about the weights that may be expected under ordinary commercial conditions. We find that, all the fattening-pigs included, a total of 387 gave an average weight of 200 lb. at 32 weeks or, roughly, 7½ months old. This is a weight that the practical feeder may hope to obtain if he keeps reasonably well-bred stock, and feeds carefully on suitable, but not necessarily expensive, rations ; for although the College pigs may have had some advantage as regards housing and attention, it must not be overlooked that a proportion of the 387 pigs under experiment was fed on certain rations, which, for purposes of comparison, were necessarily not the best that could have been devised for feeding for bacon production. An average live weight of 200 lb. at 7½ months might well be taken by pig-feeders as a measure of the average weight to be attained by their feeding-pigs, and of the general efficiency of the management. We frequently hear from pedigree breeders that individual pigs, generally their show pigs, have put on remarkably high weights in a certain time. The really important matter, however, from a commercial standpoint, is the average for all the pigs reared to pork or bacon weights. The Harper Adams pigs did not go through a store period, but were fed steadily from the weaning stage until disposed of for slaughter. This is sound practice, and it is only in very exceptional circumstances, as, for example, when an appreciable improvement in prices is confidently anticipated, and ultimately realized, that a store period is likely to be justified by the financial returns.

Dr. Crowther's results in substituting the less expensive soya-bean meal* plus minerals for fish meal in the rations of feeding-pigs are already well known, and soya-bean meal is being widely used for inclusion in the rations of fattening pigs. It is of additional interest, however, that definite percentages are now recommended, namely, from 12 per cent. in the early stage decreasing to 5 per cent. in the later stage, giving an average quantity of about 8 per cent. throughout the fattening period. A point that may have some bearing upon the efficiency of soya-bean meal, as compared with fish meal, in the rations of fattening pigs, is whether or not the dams of the pigs received fish meal while suckling their litters ; and whether

* It might be preferable to use decorticated ground nut meal, a British product, in place of soya-bean meal.

the pigs that, during the fattening period, did as well on soya-bean meal as on fish meal had received fish meal or other forms of animal protein up to the time that the experiment started. The initial weight at the start of the experimental period was about 60 lb., so that presumably the pigs were about 15 or 16 weeks old by the time they were put under experiment. One would expect that the nature of the feeding in the first 16 weeks of the pigs' life would considerably influence their subsequent rate of growth. We have found it generally advantageous to include in the ration at least 5 per cent. of fish meal, or an equivalent amount of some other form of animal protein, in the early part of the pig's life. That fish meal may be economically replaced with soya-bean meal at a later stage is demonstrated by the Harper Adams experiments.

The question of minerals is a difficult one, because much depends on local conditions, and upon the nature, and source of origin, of the foods composing the diet. However, in his experiments on fattening pigs, Dr. Crowther is quite definite that the only necessary minerals in the ration were limestone and salt, and it is useful to have his recommendation as regards quantities—namely, $1\frac{1}{2}$ lb. ground limestone and $\frac{1}{2}$ lb. salt—per 100 lb. of mixed meal. It would not be seriously incorrect if these quantities were added to each cwt. instead of each 100 lb. of the meal mixture, if it should prove more convenient in the process of mixing, as it is not suggested that a hard and fast figure for the percentage of minerals required can be laid down at present. Dr. Crowther found no advantage from the inclusion of iodine, but, no doubt, those who have faith in its value, and wish to err, if at all, on the safe side, will prefer to use salt in the "iodized" form.

Prices of Feeding Stuff.—Little change is taking place in the comparative price of feeding stuffs. Maize and the various maize products are offered at prices that represent 1s. 2d. to 1s. 7d. per unit of starch equivalent. Maize gluten feed at 1s. 5d. and palm kernel meal at 1s. 6d. are comparable at about the same price. Locust bean meal has a limited use for feeding to cattle on grass, and to fattening pigs—in the latter case, say, in the proportion of one-tenth of the ration—and is relatively inexpensive at 1s. 8d. per unit. Linseed cake, decorticated ground nut cake, soya-bean cake, and undecorticated cotton cake, are costing about 2s. 2d. to 2s. 5d. per unit S.E. The last named is difficult to replace for feeding to cows and fattening cattle on grass—to supply some protein and to counteract the scouring tendency of the fresh grass that has

grown abundantly in most districts as the result of the rains in late July and early August. English barley meal, bran, and millers' offals are relatively dear at 2s. to 2s. 8d. per unit.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	6 16
Maize	†78	†7.6	5 3
Decorticated ground-nut cake ..	73	†41.3	8 0
„ cotton cake	†68	†34.7	7 10

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.61 shillings, and per unit protein equivalent, 1.35 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1931, issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

Crops	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 9
Oats	60	7.6	5 7
Barley	71	6.2	6 3
Potatoes	18	†0.8	1 10
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 12
Beans	66	20.0	6 13
Good meadow hay	37	4.6	3 6
Good oat straw	20	0.9	1 12
Good clover hay	38	7.0	3 11
Vetch and oat silage	13	1.6	1 3
Barley straw	23	0.7	1 18
Wheat straw	13	0.1	1 1
Bean straw	23	1.7	1 10

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 6d. net.

† Revised figures for starch and protein equivalents of certain feeding stuffs are now given.

Description	Price per qr.		Price per ton	Mann- rial value per ton	Cost of food value per ton	‡ Starch equiv. per 100 lb.	Price per unit starchequiv.		‡ Pro- tein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	6 12	0 8	6 4	72	1 9	0-94	9-4
Barley, British feeding	—	—	7 0	0 7	6 13	71	1 10	0-98	6-1
" Canadian No. 3 Western ..	24 0	400	6 15	0 7	6 8	71	1 10	0-98	6-1
" Argentine	25 0	"	7 0	0 7	6 13	71	1 10	0-98	6-1
" Karachi	25 0	"	7 0*	0 7	6 13	71	1 10	0-98	6-1
" Russian	23 0	"	3 8½	0 7	6 1	71	1 8	0-89	6-1
Oats, English white	—	—	8 10	0 7	8 3	60	2 9	1-47	7-4
" " black and grey	—	—	8 0	0 7	7 13	60	2 7	1-38	7-4
" Canadian No. 2 Western ..	22 9	320	8 0	0 7	7 13	60	2 7	1-38	7-4
" " mixed feed	16 0	"	5 12*	0 7	5 5	60	1 9	0-94	7-4
" Argentine	18 9	"	6 12	0 7	6 5	60	2 1	1-12	7-4
" Russian	21 9	"	7 12*	0 7	7 5	60	2 5	1-29	7-4
Maize, Argentine	22 0	480	5 3	0 7	4 16	78	1 3	0-67	7-4
Peas, Indian	—	—	8 10*	0 14	7 16	69	2 3	1-30	18-1
" Japanese	—	—	23 5*	0 14	22 11	69	6 6	3-48	18-1
Milling offals—									
Bran, British	—	—	5 15	0 17	4 18	43	2 3	1-20	9-1
" broad	—	—	6 2	0 17	5 5	43	2 5	1-29	10
Middlings, fine imported ..	—	—	6 17	0 12	6 5	69	1 10	0-98	12-1
" coarse British	—	—	6 12	0 12	6 0	56	2 2	1-16	10*
Pollards, imported	—	—	6 0	0 16	5 4	62	1 8	0-89	11
Meal, barley	—	—	7 0	0 7	6 13	71	1 10	0-98	6-1
" maize	—	—	6 0	0 7	5 13	78	1 5	0-76	7-4
" " South African	—	—	5 15	0 7	5 8	78	1 5	0-76	7-4
" " germ	—	—	6 0	0 11	5 9	79	1 5	0-76	8-1
" locust bean	—	—	6 5	0 6	5 19	71	1 8	0-89	3-4
" bean	—	—	8 0	0 17	7 3	66	2 2	1-16	19*
" fish	—	—	14 0	2 7	11 13	59	3 11	2-10	63
Maize, cooked flaked	—	—	6 15	0 7	6 8	84	1 6	0-80	9-1
" gluten feed	—	—	6 0	0 12	5 8	76	1 5	0-76	19*
Linseed cake, English, 12% oil ..	—	—	8 10	1 0	7 10	74	2 0	1-07	24-6
" " " 9% "	—	—	8 5	1 0	7 5	74	2 0	1-07	24-6
" " " 8% "	—	—	8 0	1 0	7 0	74	1 11	1-03	24-6
Soya-bean cake, 5½% oil	—	—	5 0*	1 7	6 13	69	1 11	1-03	26-6
Cottonseed cake—									
English, 4½% oil	—	—	5 5	1 0	4 5	42	2 0	1-07	17
Egyptian, 4½% oil	—	—	5 0	1 0	4 0	42	1 11	1-03	17-3
Decorticated ground-nut cake,									
6-7% oil	—	—	8 0	1 6	6 14	73	1 10	0-98	41-1
Palm-kernel cake, 4½-5½% oil ..	—	—	6 2½	0 11	5 11	73	1 6	0-80	16-4
" " meal, 4½% oil	—	—	6 12½	0 11	6 1	73	1 6	0-89	16-4
" " meal, 1-2% oil	—	—	5 15	0 12	5 3	71	1 5	0-76	16-4
Feeding treacle	—	—	5 0	0 8	4 12	51	1 10	0-98	2-7
Brewers' grains, dried ale	—	—	5 15	0 12	5 3	48	2 2	1-16	12-5
" " porter	—	—	5 5	0 12	4 13	48	1 11	1-03	12-5

At Bristol. † At Liverpool. ‡ At Hull. § Revised figures for the starch and protein equivalents of cereals feeding stuffs are now given.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of July, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on the basis of their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £ 8 10 per ton, then since its manurial value is 50% per ton as shown above, the food value per ton is £ 5. Dividing £ 5 by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is £ 6.7. Dividing this again by 24.6, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 2d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value for the money. The prices quoted on his own markets. The figures given in the table under the heading manurial value per ton calculated on the basis of the following unit prices:—N, 2s. 1d.; P₂O₅, 2s. 4d.; K₂O, 2s. 6d.

MISCELLANEOUS NOTES

As, on account of the financial emergency, no other funds were available for Agricultural Research Scholarships in the academic year 1932-33, the Agricultural Research Council decided that, in order to keep the Scholarship Scheme in being, they would award, out of the funds at their disposal, not more than two Studentships for Research in Animal Health, and not more than three Agricultural Research Scholarships. The Council have now made the following awards in connexion therewith:—

Studentships of Research in Animal Health

Mr. G. Slavin, M.R.C.V.S. Mr. E. G. White, M.R.C.V.S.

Agricultural Research Scholarships

Miss G. M. Herford, B.Sc. Mr. G. R. Howat, B.Sc.
Mr. J. L. Russell, M.A.

The administrative arrangements in connexion with these awards are being undertaken on behalf of the Council by the Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland.

* * * * *

THE annual award of scholarships from the United Dairies Scholarship Fund was announced recently. The Fund, amounting to £30,000, was created by United Dairies, Ltd., in 1924, for the purpose of promoting and encouraging practical and scientific education in dairying and dairy farming. The scholarships, which are available for the sons and daughters of farmers and smallholders in the counties of Cornwall, Devon, Dorset and Somerset, are tenable at various agricultural colleges. The successful candidates this year are as follows:—

Reading University —

One-Year Extension Course in Dairying: J. B. Fry (holds U.D. Scholarship granted 1930).

Three-Year Degree Course in Agriculture: H. Burr, W. P. J. Arthur.

Two-Year Diploma Course in Dairying: Eunice L. Coleman.

Seale-Hayne Agricultural College—

One-Year Course in Dairying and Agriculture: H. W. Hicks.

Somerset Farm Institute, Cannington—

One-Year Course in Dairying: Susan Bennett, Monica G. Anstey, C. M. Kallaway, T. J. Yeatman.

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland in the three months ended June, 1932, compared with the corresponding period of 1931. (From returns supplied by H.M. Customs and Excise.)

Country to which exported	April to June, 1932		April to June, 1931	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina	74	9,505	43	7,226
Belgium	0	0	37	783
France	7	260	0	0
Italy	0	0	48	2,600
Uruguay	11	790	28	2,715
Australia	3	475	0	0
Canada	32	1,710	28	2,800
Gibraltar	19	720	0	0
Irish Free State ..	333	7,374	338	7,140
Kenya	3	122	9	466
Union of South Africa ..	8	1,193	10	910
Other countries ..	6	255	2	300
Total	496	22,404	543	24,940
SHEEP AND LAMBS				
France	61	620	44	460
Italy	25	125	0	0
Spain	0	0	14	206
Australia	2	120	0	0
Canada	0	0	11	110
Irish Free State ..	78	208	7	98
Union of South Africa ..	0	0	6	100
Tanganyika Territory ..	33	368	0	0
Total	199	1,441	82	974
SWINE				
Belgium	6	60	2	13
France	1	12	42	678
Italy	27	135	41	420
Morocco	0	0	5	75
Netherlands	5	43	0	0
Poland	0	0	10	309
Roumania	3	45	0	0
Switzerland	0	0	11	240
Irish Free State ..	151	960	4	43
Union of South Africa ..	6	66	1	30
Other countries ..	1	20	2	46
Total	200	1,341	118	1,845

THE Director of Agriculture for Punjab, India, draws attention to the forthcoming second award of the Maynard-Ganga-Ram Prize for the improvement

The Maynard-Ganga-Ram Prize of agriculture in the Punjab, concerning which further particulars are given in the advertisement pages of this issue. A note announcing the first award of the Prize, which is of the value of 3,000 rupees (approximately £225), to Dr. C. A. Barber, of Cambridge, appeared on page 446 of the July, 1931, issue of this JOURNAL. It may be remembered that the Prize was founded by the late Sir Ganga Ram, and is awarded triennially for a discovery, invention, or new practical method that will tend to increase the agricultural production of Punjab on a paying basis. The Prize is open for world-wide competition and Government servants are eligible for entry. Applications in this second competition for the Prize should reach the Director of Agriculture for Punjab, Lahore, India, not later than December 31 next.

* * * * *

THE undermentioned Certificate and Report, issued by the Ministry in respect of the performance, under test, of a milking machine, have been printed and published together in pamphlet form.

**Agricultural
Machinery Testing
Committee**

Copies of the pamphlet can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 3d. net, post free 3½d.

No. 38. "Wallace" Milking Machine.

The machine was submitted for test by the manufacturers, Messrs. J. & R. Wallace, The Foundry, Castle-Douglas, Kirkcudbrightshire, Scotland.

* * * * *

THE July index figure for prices of agricultural produce moved downwards by a further 5 points to only 6 per cent. above the level of the base years, 1911-13,

The Agricultural Index Number this being the fourth successive month in which the index has declined. At the corresponding period a year earlier, a decline of 2 points to 21 per cent. above pre-war was recorded. All descriptions of fat stock were cheaper in July than in June, while first early potatoes were marketed at a much lower figure than that prevailing for old crop potatoes in the

previous month. On the other hand, butter, milk and eggs showed a rise.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1927 :—

Month	Percentage increase compared with the average of the corresponding month in 1911-13.					
	1927	1928	1929	1930	1931	1932
January	49	45	45	48	30	22
February	45	43	44	44	26	17
March	43	45	43	39	23	13
April	43	51	46	37	23	17
May	42	54	44	34	22	15
June	41	53	40	31	23	11
July	42	45	41	34	21	6
August	42	44	52	35	21	—
September	43	44	52	42	20	—
October	40	39	42	29	13	—
November	37	41	44	29	12	—
December	38	40	43	26	17	—

Grain.—Quotations for wheat showed a slight advance during the period under review, but as a proportionately greater rise occurred in July of the base years, the index number was one point lower at 21 per cent. less than pre-war. In the case of barley, however, an increase in price of 2*d.* per cwt. was accompanied by a gain of one point in the index. Oats were about 3*d.* per cwt. cheaper on the month, and the index figure fell by 6 points to 1 per cent. over 1911-13.

Live Stock.—Values for all descriptions of fat and store stock were lower in July than in June. Fat cattle realized about 2*s.* 6*d.* per live cwt. less money, selling at 17 per cent. more than in the base period. There was a comparatively sharp fall of $\frac{3}{4}$ *d.* per lb. in the average price of fat sheep, and the index figure dropped by 10 points to 3 per cent. below pre-war. This is the lowest monthly index for fat sheep recorded since February, 1912. Fat pigs showed a further decline on average for the month, the index number for baconers being 4 points and for porkers 5 points lower. Quotations for dairy cows receded by about 10*s.* per head and the index by 4 points to 12 per cent. in excess of pre-war. As regards store cattle, an average decline of 14*s.* per head was recorded, the index falling to 13 per cent. above 1911-13. The index number for store sheep was 8 points lower than in June, while for store pigs there was a loss of one point.

Dairy and Poultry Produce.—A slight seasonal advance occurred in the average price of milk delivered under contract, and the index figure appreciated by 6 points to 43 per cent.

above 1911-13. Butter also was a little dearer at 4 per cent. in excess of the base level. As regards cheese, the increased marketing of new produce caused the average price to decline rather sharply, and the index number showed a drop of 22 points to 31 per cent. above pre-war. Eggs continued to advance, and the index figure was 12 points higher at 14 per cent. in excess of 1911-13.

Other Commodities.—First early potatoes were marketed at about 50s. per ton less than the price realised by old crop potatoes in June, and the index figure was as much as 79 points lower on the month at 34 per cent. above the level of the base years. In July, 1931, the index was 79 per cent. above 1911-13. Both clover and meadow hay were again cheaper at 34 per cent. under pre-war prices. Wool, however, showed a slight recovery from the very low values prevailing in June. Prices of soft fruits were generally higher than in the corresponding month of 1931.

Index numbers of different commodities during recent months and in July, 1930 and 1931, are shown below:—

*Percentage Increase as compared with the Average
Prices ruling in the corresponding months of
1911-13*

Commodity	1930	1931	1932			
	July	July	April	May	June	July
Wheat	2	-23*	-21*	-23*	-20*	-21*
Barley	-12*	-19*	1	-7*	-7*	-6*
Oats	-20*	-12*	5	7	7	1
Fat cattle ..	30	29	18	20	18	17
„ sheep ..	66	38	3	7	7	-3*
Bacon pigs ..	40	Nil	Nil	3	-9*	-13*
Pork „ ..	49	10	9	6	-9*	-14*
Dairy cows ..	32	27	19	18	16	12
Store cattle ..	29	31	15	15	15	13
„ sheep ..	78	53	-11*	-11*	-2*	-10*
„ pigs ..	100	31	4	Nil	-15*	-16*
Eggs	44	19	7	-3*	2	14
Poultry	47	44	27	36	32	19
Milk	58	52	50	37	37	43
Butter	31	10	11	8	-4*	4
Cheese	32	28	39	43	53	31
Potatoes	23	79	139	145	113	34
Hay	18	-13*	-32*	-30*	-31*	-34*
Wool	-4*	-34*	-31*	-33*	-43*	-42*

*Decrease.

Most poultry-keepers are already aware of the serious losses which they may incur through the introduction of Bacillary White Diarrhoea into their flocks by chicks purchased from hatcheries; but as it is hardly possible to pay too much attention to this matter, the Ministry would remind them of a possible precaution against such losses.

The disease is conveyed to the chicks by infected hens through their eggs, and it is therefore of the utmost importance that stock used for breeding purposes should be free from it. By means of the agglutination test, which is now used by many poultry-keepers, hens which are "carriers" of the disease may be detected and can then be eliminated. Purchasers of day-old chicks and eggs for hatching should accordingly insist in all cases on evidence that the stock on farms from which it is proposed to purchase such chicks or eggs has been subjected to the agglutination test (during the current breeding season) by a reputable laboratory, and that no reacting birds were found in the last test.

The Ministry desires also to point out that a number of county authorities for agricultural education now accredit poultry breeding farms where the quality of the breeding stock reaches an approved standard, and where the birds have been subjected to the agglutination test according to regulations laid down for the scheme. A list of the counties adopting this scheme may be obtained on application to the Ministry of Agriculture, 10 Whitehall Place, London, S.W.1.

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In every district there must be many discarded agricultural implements that are valueless for all practical purposes and that in many cases are rapidly perishing through exposure and neglect. These implements are part of the history of the country, and in their right setting may be of great and increasing interest.

Agricultural Museums

The Science Museum at South Kensington already has an extensive collection of examples of old farm implements and tools and would be glad to obtain additional examples to add to and complete its collection. The existing collection is described in an illustrated guide, entitled *Agricultural Implements and Machinery*, by A. J. Spencer and J. B. Passmore (price 2s. net). The guide also contains an historical

review telling the story of the development of the use of tools and machinery in farming.

Further gifts of disused implements would be much appreciated, but, before sending them, a letter should be addressed to the Director of the Museum describing the object it is proposed to present, if possible, with a photograph. The guide will indicate whether there is already a similar object on exhibition, but even if this should be the case the Museum will be glad to obtain occasionally additional examples which may be slightly different from any in its possession.

Should it prove that the Science Museum does not desire the particular implement offered, the gift may provide a valued addition to some other public collection. Where, therefore, there is a museum in the county town, with possibly a small collection of agricultural implements which needs to be expanded, the implement might be presented to it. Alternatively, it might be kept as a nucleus round which a local collection might grow. In any event the Science Museum authorities will use their good offices to ensure that any implement of historical interest shall find a place in an appropriate collection.

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THE *Guide to Current Official Statistics*, a new volume of which has been recently issued,* will prove of great assistance to the inquirer who desires to ascertain the extent and nature of the official statistics that may be available in regard to any particular phase of agricultural or other activities. The *Guide*, which has been issued annually for some years past, contains not only a list of the titles and prices of the statistical volumes issued by each Government Department, but also an alphabetical index of their contents with particulars of the degree of detail in which the subject is treated and the time and place to which the statistics relate. Directions are given for using the subject index to the fullest advantage, and, by following these directions, no difficulty should be experienced in ascertaining exactly what official statistics are published in regard to any subject, and the names and prices of the publications concerned.

* Volume X (357 pages) relating to the year 1931. H.M. Stationery Office. Adastral House, Kingsway, London, W.C.2, or through any bookseller (price 1s. net or 1s. 5d. post free).

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held on July 26, 1932, at 7 Whitehall Place, London, S.W. 1, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders carrying into effect the Committee's decisions :—

Cambridge and Isle of Ely.—An Order fixing special minimum rates of wages for the employment of male and female workers on the corn harvest of 1932. The rate in the case of male workers of 21 years of age and over is £11 for a period of four weeks of 64 hours per week (excluding Sundays) with payment for Sunday work and for employment in excess of 64 hours per week at 11d. per hour. The special minimum rate for female workers of 18 years and over is 8d. per hour for all employment on harvest work. This Order does not apply to workers hired on a day-to-day contract to assist in harvest work and whose total period of employment on harvest work does not exceed 14 days with any one employer.

Essex.—An Order fixing special overtime rates of wages for male workers and special minimum rates of wages for female workers during the corn harvest of 1932. In the case of male workers of 21 years of age and over the special rate for overtime employment on harvest work is 10d. per hour. In the case of female workers of 21 years of age and over the minimum rate payable for all employment on harvest work is 7d. per hour.

Suffolk.—An Order fixing special minimum rates of wages for the employment of male workers during the corn harvest of 1932, the rates for such workers of 21 years of age and over being :—

(a) In the case of farms of at least 60 acres of corn £5 for the harvest in addition to the minimum weekly wage and in lieu of overtime rates, the hours in respect of which this rate is payable being 12 on any weekday whilst the crops are being carted, and 11 whilst other harvest work is in progress, but so that the hours in any one week shall not exceed 70 ; where a worker is employed for part only of the harvest the special minimum rate is 10d. per hour for all employment on harvest work ;

(b) In the case of farms of less than 60 acres of corn 10d. per hour for all employment on harvest work.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

Enforcement of Minimum Rates of Wages.—During the month ending August 14, legal proceedings were instituted against four employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow :—

County	Court	Fines imposed			Costs allowed			Arrears of wages ordered			No. of workers involved
		£	s.	d.	£	s.	d.	£	s.	d.	
Dorset	.. Sherborne			*	—			—			1
Gloucester	.. Bristol	2	0	0	—			14	0	0	3
Lancashire	.. Warrington	0	10	0	0	2	0	14	7	1	1
Yorks, N.R.	.. Wath	3	0	0	0	12	6	11	3	5	3
		£5	10	0	£0	14	6	£39	10	6	8

* Case dismissed.

Foot-and-Mouth Disease.—An outbreak of foot-and-mouth disease was confirmed at Little Malvern, Worcestershire, on August 2, 1932, and further outbreaks were confirmed in the immediate neighbourhood on August 3 and 5. The usual restrictions were imposed upon an area with a radius of approximately 15 miles round the infected premises.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS ENGLAND

Essex : Miss Betty Lang, N.D.P., has been appointed Assistant Poultry Instructress, *vice* Miss V. D. Harrison.

Miss N. B. McCabe has been appointed Student Assistant in Horticulture, *vice* Miss D. M. Saunders, Assistant Lecturer in Horticulture.

Lancashire : Mr. Godfrey F. V. Morgan, N.D.A., N.D.D., has been appointed Dairy Bacteriologist, *vice* Mr. F. Procter.

Sussex, East : Consequent on the reorganization of the staff, following the death of Mr. R. C. Saxby, Lecturer in Agricultural Chemistry, Mr. W. Sanson has been appointed Farm Bailiff and Instructor.

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NOTICES OF BOOKS

Agricultural Depression and Farm Relief in England, 1813-1852. By Leonard P. Adams. Pp. xiv+191. (London: P. S. King & Son, Ltd. 1932. Price 7s. 6d.)

In his introduction to this work, the author states that it was inspired by a desire to point out the similarity of the depression that occurred after the Napoleonic Wars to that of the present day. He has also attempted to estimate the value of the relief measures, both proposed and enacted, in the light of available data.

Such a study is undoubtedly opportune, and, although the range of authorities consulted is not wide, it is sufficient to allow the salient features of the subject to be depicted.

Naturally enough the book is largely concerned with a discussion of the controversy about the Corn Laws, but the author does not fail to mention the Tithe Act of 1836, the Poor Law Act of 1834, the activity of the Government in attempts at price regulation and in supplying financial aid for drainage schemes as well as the farmers' own attempts to improve their situation. The coming of the period of high-farming rightly marks the end of his discussion of the subject. The comparison between relief measures adopted in the early nineteenth century and those of the twentieth century is slight and might perhaps have been expanded, but perhaps we may hope for a more complete study of the subject from the writer at a later date. That there is no reference to the work of J. L. and Barbara Hammond in the acknowledged sources of information is a significant omission.

Corn and Hog Surplus in the Corn Belt. By Alonzo E. Taylor. Pp. xxi + 658. (Stanford, California: University Press, 1932. Price \$4.50.)

The author of this work correctly states in his preface that the Corn (Maize) Belt "exhibits in some respects the most distinctively American farming," and, since it is a type of farming that is not and cannot be practised in this country, the interest of the book to British farmers is not immediately apparent. The problems, however, that

confront the farmers of the Corn Belt are in type the same as those that confront farmers in all other parts of the world. Their agriculture has become so developed that they are unable to sell their produce at an economic price, and this book is an exhaustive study of their difficulties and the proposed remedial measures to be taken to improve their situation.

The author discusses the change in American economic conditions and the falling demand for agricultural products in relation to the possibility of producing largely increased quantities of cheaply grown goods. Throughout the world the same problem presents itself, and the factors that cause it are held to be the declining rate of increase in world population and the declining rate of *per capita* consumption of foodstuffs.

After fully discussing the development and present position of the Corn Belt system of farming Dr. Taylor considers all the proposals that have been made in the United States relative to farm relief. These are the Equalization Fee, the Export Debenture Plan, the Farm Allotment Plan and Price Stabilization, all of which aim at ameliorating the consequences of a surplus of corn and pigs, as well as at helping to overcome the difficulties with which other types of farming find themselves confronted. The final chapter is devoted to internal methods of farm relief, and includes suggestions for technical improvements in management and practice, the better utilization of the area by a smaller farm population and the adjustment of supply to demand.

The Optimum Size of Agricultural Holdings in the United States of America (*Die zweckmässigen Betriebsgrössen in der Landwirtschaft der Vereinigten Staaten von Amerika*). By Dr. Siegfried von Ciriacy-Wantrup. Pp. 149. (Berlin: Paul Parey, 28 and 29 Hedemannstrasse, S.W. 11. 1932. Price RM.10.60.)

A careful study of the conditions in one farming area may supply information that has reference to the conditions in another area widely separated from it in space and working under quite a different system of farming. This is such a study. Dr. von Ciriacy-Wantrup has given us in great detail the results of his economic researches in the Corn Belt of Illinois, and his conclusions regarding the rise of this specialized system of farming in its relation to the size of holding and the net product per holding, per unit of area and as a percentage of the capital employed. The possibilities of the future are also discussed.

It is not too much to say that no factor entering into the problem of judging the optimum size of holding in this area has been neglected, but it would involve a long and detailed notice of the book to supply full details of its method and contents. The natural and economic conditions in Illinois are first presented and the agricultural and economic bases of the development of farming in the U.S.A. with special reference to the State under consideration are examined as well as the growth of large farms in the country from 1850 to 1925. The relation between the size of farms and farm management and the results of working different sizes of holdings are also studied.

The whole work is illustrated with a wealth of statistical detail which is of great interest. It might with advantage be studied in conjunction with Dr. Alonzo E. Taylor's work on *The Corn and Hog Surplus*.

Pigs and Bacon Curing. By R. E. Davies. Pp. xv+109. (London: Crosby Lockwood and Son. Second Edition, 1931. Price 4s. 6d.)

This book provides detailed information of many different methods of curing bacon and hams on the farm and in the factory. It also gives

a concise description, with illustrations, of the best types of pigs and the methods of feeding and fattening.

Pig-Keeping and Pig Products of the World (*Die Schweinehaltung der Welt und der Handel mit ihren Erzeugnissen*). By Dr. K. Ritter. Pp. vi+366. (Berlin: Paul Parey, 28 and 29 Hedemannstrasse, S.W.11. Price RM.27.50.)

This is a useful survey of the distribution of the world's pig population and trade in pig products. It includes for practically all countries statistics of pre-war and post-war pig population, and external trade in pigs and pig products. A comparison is made between surplus and deficiency areas, and sections are devoted to market organization and prices. Although statistics are not given later than 1930, this is an extremely useful reference book for students of the pig industry in all its aspects.

The Biology of Radium and Uranium (*Biologie des Radiums und Uraniums: Vol. I, Biologie des Radiums und der Radioactiven Elemente*). By J. Stoklasa and J. Penkava. Pp. xiv+958. (Berlin: Paul Parey, 28 and 29 Hedemannstrasse, S.W.11. Price RM.74.)

The last thirty years have brought notable additions to our knowledge of radioactivity, and its far-reaching importance has steadily become more appreciated. So extensive is the subject that the records of progress have necessarily been scattered over a wide range of scientific literature, rendering it difficult for an interested worker to keep abreast of the advances in any particular field of inquiry. Stoklasa and his co-workers have devoted twenty-five years to research on the biology of radium and other radioactive elements, and their book discusses the first part of their results, along with those of other workers in the same field. An attempt has been made to cover the ground as completely as possible, both as regards the distribution of radioactive materials in earth, air and water, and their action in relation to all aspects of the bio-chemistry and growth of micro-organisms, higher plants, animals and human beings. It is hardly possible to outline the range of investigation covered, as this first volume comprises nearly one thousand pages, clarified by tables and illustrations, with bibliographies appended to their appropriate sections, and comprehensive author and subject indexes to aid reference. The medical side of the problem is dealt with, though not fully elaborated, more attention being focussed on the effect of radioactivity on different phases of plant growth. In this connexion it is of interest to note the beneficial results on plant development (e.g., increase in size of flowers) that are attributed to the radioactivity of water. Irradiated eggs of silkworms are also shown to produce larger larvæ, which in their turn develop into bigger moths laying larger eggs than usual. Due attention is also paid to toxic action, as when the germination of seeds is impaired by exposure to too high a degree of radioactivity. Cell destruction by radium emanations is now acknowledged to be of the greatest therapeutic value.

The authors are to be congratulated on their lucid classification of the mass of available data. It may be hoped that the companion volume will make an early appearance, to complete a work that will prove a most valuable book of reference for all biologists, and in particular for plant physiologists.

Marketing Agricultural Products. By F. E. Clark and L. W. H. Weld. Pp. xiv+1672. (New York: The Macmillan Co. London: Macmillan & Co., Ltd. 1932. Price 21s.)

This book is by the authors of *Marketing Farm Products*, published in 1915, and brings that work up to date. The great developments

that have taken place in the sphere of agricultural marketing in the interval have, however, as the authors point out, made it impossible to use more than a very little of the original text.

The subject is treated from a functional rather than a commodity standpoint. The primary purpose of the book is to describe and analyse the marketing machinery for all kinds of agricultural produce in the United States, and in this respect it is very comprehensive. An exceedingly interesting chapter to the British reader is that which outlines the policy of the Federal Farm Board and the developments that have taken place under its auspices.

Little is attempted in the way of broad criticism or constructive suggestion. A summary of what appear to the authors to be the main defects of the existing system and an indication, in a general way, of possible lines of remedial action occupy the last chapter. The avowed view of the authors, however, is that "on the whole the marketing machinery of the country is fundamentally sound and generally efficient; and that progress will come in the future, not from revolutionary changes, but from the gradual improvement of our present system." It is, nevertheless, somewhat difficult to regard the machinery of marketing in the United States as a single system. Alongside the old individualistic system, working without any central co-ordination, there is growing up a more rational system by which, through the gradual federation of local co-operative associations into comprehensive centralized bodies, organized producers are putting themselves in a position to exercise a unified control over marketing policy.

The suggestion that a reorganization of the whole system of marketing from producer to consumer along co-operative lines will greatly improve marketing may not be as "fanciful" as the authors think, so long as one realizes that "co-operation" need not be confined to producers and consumers and need not involve more than a common agreement, along the whole marketing chain, upon a single line of policy. "Co-operation," in this sense, between primary producers and the processing industries and distributive trades that come between producer and consumer, does not appear to have been envisaged by the authors of this work. It is in this direction that there appears to be likelihood of considerable development, and one is tempted to suggest that this work might have gained something if modern marketing tendencies in countries outside the United States had been discussed.

Rabbits, 1932 : The Year Book of the National Rabbit Council. Pp. v+82. (Obtainable from the Hon. Sec., Dr. J. N. Pickard, Animal Breeding Research Department, University of Edinburgh. Price 1s. 6d.)

Those who are interested in the rabbit industry will find much useful matter in this publication, which records the activities of the National Rabbit Council during the past year. Clubs and societies affiliated to the Council now number 36 as compared with 19 in 1930. Information is given concerning the Council's scheme for post-mortems and advice at reduced charges to members, the preparation of bibliographies by the Imperial Bureaux of Parasitology, Genetics and Nutrition, and the establishment of killing centres in 11 English counties and in Scotland in connexion with a collective marketing scheme. The object of this scheme is to assist small producers to market carcasses profitably by securing more uniform dressing, selling in bulked quantities from various districts, reducing freight charges, and improving grading. Further schemes for research at Edinburgh University and at Harper

Adams Agricultural College have been approved. The Year Book also includes lists of qualified District Advisors who are prepared to deal with practical problems relating to rabbit keeping, of approved killing centres, members, and affiliated organizations, in addition to brief articles dealing with the varieties known to British breeders.

Principles of Soil Microbiology. By S. A. Waksman. 2nd ed. Pp. xxviii+894, 15 plates and 83 text figures. (London: Baillière, Tindall & Cox. 1931. Price 52s. 6d.)

This second edition of "Waksman" will need little introduction to the large numbers of soil investigators who have already found the work to be practically indispensable as a manual of reference. Successive editions of standard general works tend to increase in bulk, but this second edition of the book actually contains three fewer pages than the first edition. This satisfactory result has been obtained by considerable compression of less important sections, references being substituted for discussion. A much longer index of author-names has been included, but the subject index—capable of extension—remains substantially unaltered.

The new edition is in several respects a marked improvement upon the first, and deserves much praise. The chapter upon "Mycorrhiza fungi" is especially good. On account of its academic nature, the book cannot be of direct interest to the majority of agriculturists. From the point of view of British agriculture it is questionable—despite the recent work of Albert Howard and Yeshwant Wad ("Waste Products of Agriculture")—whether the advantages of adding compost to the soil in place of a mixture of straw and nitrogenous and mineral salts are as "manifold" as the author believes (p. 639). The rotation experiments begun at Rothamsted a year or two ago, though too recent to supply a definite answer, suggest that the addition of mineral salts and nitrogen to straw on the field may be good practice.

A Study of Empire Wool Production. By J. E. Nichols. Illus. Pp. 150. (Leeds: Wool Industries Research Association, Torridon. Headingley. Price 5s.)

In this brochure, Dr. Nichols gives the results of a survey of Empire Wool Production made during the years 1928-31 on behalf of the Wool Industries' Research Association. Over a great part of the Empire, wool is the most valuable primary product grown, and the Dominion clips are a source of supply for the textile industries of the world. The subject matter of this survey is, therefore, of great intrinsic importance, and it contains much that will interest producers in the home land. Dr. Nichols' approach is essentially biological, the greater part of his monograph being devoted to discussion of the various breeds of sheep that predominate in the countries visited, and to the influence of breeding, environment and production conditions upon the maintenance and improvement of wool quality. Attention is also paid to the position occupied by local wool-manufacturing industries.

The sections dealing with the development of the British breeds of sheep under new conditions, and with the evolution of new breeds from merino crossed with long wool stock, such as the Corriedale in New Zealand and the Polwarth in Australia, are of special interest to the sheep breeder of this country. The evidence shows the importance attached to wool production in New Zealand; this is illustrated by the waning popularity of the Shropshire for cross-breeding for early lamb production on account of its dark face and tendency to black hairs. New Zealand to-day, as Dr. Nichols points out, is essentially a country

of mutton sheep; but the producer there has succeeded in combining admirable carcass characteristics with high average wool production. In view of this it is open to the producer of this country to consider whether he should not aim at a balance sheet that more nearly corresponds to that of New Zealand where the wool clip regularly produces a higher income than that from the sale of the carcass. This survey brings out clearly the remarkable influence exercised by the pedigree breeder in the improvement of the clip. Nowhere, of course, has this been so marked as in Australia, where the wool-growing industry has been transformed by the infiltration into commercial flocks of the blood of comparatively few stud flocks. In South Africa also much progress has been made of late. Dr. Nichols is of opinion that by the co-operation of the practical breeder and of the scientist great advances remain to be made both in the improvement of sheep and in the extension of sheep breeding to areas at present unsuited to their production.

Methods of Soil Research (*Methoden für die Untersuchung des Bodens*). Part I. Ed. by O. Lemmermann. Pp. 90. (Berlin, W. 10. Verlag Chemie, G.m.b.H. 1932. Price RM.6.)

One of the outstanding problems in all soil survey and advisory work is the selection of suitable methods of analysing and classifying soils. Up to the present, uncertainties in the theoretical foundations of soil physics and chemistry have made it impossible to devise analytical methods for measuring definite fundamental soil properties, and in the meantime numerous methods, usually with some theoretical basis, have been designed to measure those properties regarded as important for plant growth or soil cultivation. The object of the book under notice—the first of a series to be issued jointly by the German Agricultural Experimental Stations and the German Soil Science Society—is to collect the more important of the methods, and in each instance to give sufficiently precise experimental details to ensure strict comparability of results obtained by different workers. No attempt is made to discriminate between one method and another; the choice is left to the individual worker. Detailed instructions are given for the taking of a soil sample, the field description, preparation for analysis; several methods are described for measuring its physical properties, and for making chemical and microbiological analyses and measuring its fertilizer requirements. Throughout the book mineral soils and organic soils are considered separately. There is a full description of the principal methods of soil analysis in use on the Continent, which should be of great value to the soil investigator and soil advisory expert in this country.

Testing Agricultural Machinery: Tillage Implements (*Les Essais de Machines Agricoles: Machines Aratoires*). By J. Bourdelle. Pp. 85. Illus. (Paris: Dunod, 92 rue Bonaparte (VI). 1932. Price 16 frs.)

Under the aegis of M. Ringelmann, the study of agricultural machinery in France has reached a definitely high level, and, as might have been expected, the present work, which pays tribute to him, is of a highly scientific character. Its contents are divided into three main headings which fall under "specification," "efficiency," and the "estimation of efficiency by analysis of its elements." What is particularly interesting in the first section is the description of a profilograph designed by M. Ringelmann for the purpose of obtaining graphic representation of the elements of tillage implements in order that comparison of the different types of design may be facilitated. Following this chapter, M. Bourdelle sets out five necessities which

go to the making up of a scientific specification, and remarks that the usual details given are essential in addition to these, but that they have only a limited application in so far as they allow the particular machine under test to be compared with others by characteristics immediately recognizable. In the section dealing with efficiency, various other pieces of ingenious apparatus are described, as well as their use and the measure of their accuracy in working. Since the effect of tillage implements upon the physical composition of the soil is, perhaps, their most important function, some of the apparatus is designed to measure the effects obtained in the course of different trials, and upon different soils, so that Bourdelle has adopted the principle that a test has two aspects: (a) the mechanical propriety of the design of the implement from an engineering point of view, and (b) the efficiency with which it performs the operation for which it is designed, in comparison with other similar implements. The section that deals with the estimation of efficiency is sub-divided and it explains the subject in various directions. Here again the nature of the soil is taken into account, as well as the results of the machine's working, and various laboratory tests have been designed to enable a measure of standardization to be obtained both in the nature of the test and in the results achieved. There is no doubt that this book should prove stimulating to engineers engaged in similar work, and we may expect to see the methods suggested taken into serious consideration by testing stations wherever they have been established.

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ADDITIONS TO THE LIBRARY

Agriculture, General and Miscellaneous

- ✓ *Keeble, (Sir) Frederick.*—Fertilizers and Food Production on Arable and Grass Land. (196 pp.) Oxford: at the University Press; London: Humphrey Milford, 1932, 5s. [338.9; 63.16.]
- ✓ *Viscount Lymington.*—Horn, Hoof and Corn: The Future of British Agriculture. (209 pp.) London: Faber & Faber, 1932, 6s. [338.1 (42).]
- Pawson, H. C.*—Modern Farming (Address delivered to the S. Scotland and Border Valuers' Assn. at Kelso, April 15, 1932). (Reprinted from "Scottish Farmer.") (16 pp.) Glasgow: Scottish Agricultural Publishing Co., 2d. [63.(42); 63.191.]
- Ex-Tenant Farmer.*—Undebated Phases of Farming. (70 pp.) Published at 5 Southend Road, Grays, Essex, 1932. 2s. 6d. (post free). [63.]
- ✓ *Hall, Sir A. D.*—Digressions of a Man of Science. (223 pp.) London: Martin Hopkinson, 1932. 7s. 6d. [92.]
- ✓ *South-Eastern Agricultural College, Wye.*—The Application of Psychology to Agriculture, by W. R. Dunlop. (27 pp.) Wye, 1932. 1s. [37; 37 (072).]
- Institut International d'Agriculture.*—Institutions s'occupant de l'enseignement agricole dans les pays chauds et les grandes nations colonisatrices. (128 pp.) Rome, 1932. [63 (024); 37.]
- ✓ *International Institute of Agriculture.*—The First World Agricultural Census. Bulletin No. 1: Irish Free State. (37 pp.) Rome, 1932, 10 lire. [31 (415).] Bulletin No. 2: Esthonia. (63 pp.) Rome, 1932. 10 lire. [31 (4).]
- ✓ *Sering, M.*—Die Deutsche Landwirtschaft unter Volks und Weltwirtschaftlichen Gesichtspunkten. (Berichte über Landwirtschaft, 50 Sonderheft.) (lii + 954 + 66 pp.) Berlin: Parey, 1932. RM.62. [338.1 (43); 63 (43).]

- Imperial Bureau of Plant Genetics*.—Account of the Research in Progress in the British Empire. (90 pp. mimeograph) Cambridge, 1932. 3s. 6d. [37 (42); 575.4.]
- Stoklasa, J.*—Biologie des Radiums und der Radioaktiven Elemente. Band I. Biologie des Radiums und Uraniums. (972 pp.) Berlin: Parey, 1932. RM.74. [537.]
- Jamieson, G. S.*—Vegetable Fats and Oils. (The Chemistry, Production and Utilization of Vegetable Fats and Oils for Edible, Medicinal and Technical Purposes.) (American Chemical Society Monograph Series, No. 58.) (444 pp.) New York: Chemical Catalog Co., 1932. \$6.50. [543.1; 63.342; 664.3.]
- Empire Marketing Board*.—E.M.B. 54: Survey of Vegetable Oilseeds and Oils. Vol. I: Oil Palm Products. (134 pp. + 2 pl.) London: H.M. Stationery Office, 1932. 1s. [63.342.]
- Man, E. H.*—The Andaman Islanders, with Report of Researches into the Language of the S. Andaman Island by A. J. Ellis. (xxxii + 224 + 73 pp. + 18 pl.) London: Royal Anthropological Institute. Reprinted 1932. [325.]

Agricultural Economics

- International Institute of Agriculture*.—The Agricultural Situation in 1930-31, being an Economic Commentary on the International Year-book of Agricultural Statistics for 1930-31. (viii + 426 pp.) Rome, 1932. 25 lire. [338.1; 35.]
- Dragoni, C.*—Economia Agraria. I: Fattori della Produzione, la Combinazione dei Fattori Produttivi, l'Esercizio dell'Impresa Agricola ed i Suoi Risultati. (794 pp.) Milano: U. Hoepli (Editore), 1932. 60 lire. [338.1.]
- Bauer-Mengelberg, K.*—Agrarpolitik in Theorie Geschichte und Aktueller Problematik. (viii + 248 pp.) Leipzig und Berlin: B. G. Teubner, 1931. [338.1.]
- South-Eastern Agricultural College, Wye*.—Department of Economics, Report No. XIII: Investigation into Farming Costs of Production and Financial Results. XII: Hay Crops and Grazing, 1924 to 1931, by J. Wyllie. (pp. 37-63.) Wye, 1932. 1s. [338.1 (42); 63.33.]
- Fordham, M.*—Britain's Trade and Agriculture. Their Recent Evolution and Future Development. (224 pp.) London: Allen & Unwin, 1932. 7s. 6d. [338.1 (42); 38 (42).]
- University of Bristol, Department of Agriculture and Horticulture*. Economics Branch. Bulletin No. 7 (Part I): A Bulletin for Somerset Farmers, 1925-1929, Part I: Introduction, Cropping, Marketing, by G. T. Roy. (48 pp.) Bristol. [338.1 (42); 63.191.]
- University of Bristol, Department of Agriculture and Horticulture*. Economics Branch. Issue No. 4: Wiltshire Agricultural Accounting Society: Factors Affecting Wiltshire Profits based upon Accounts for Cropping Year, 1930. (iv + 28 pp.) Bristol, 1932. [338.1 (42); 338.58.]
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NOTES FOR THE MONTH

IN the September issue of this JOURNAL (p. 498) was published the new scale of duties imposed by the Additional Import

Import Duties	Duties (No. 5) Order on certain imported
Advisory Com-	articles of horticultural produce. It is
mittee : Improve-	considered desirable to draw special atten-
ments in Marketing	tion in this issue to certain observations
of Fruit and	made by the Import Duties Advisory
Vegetables	Committee when recommending these
	duties.

In their report, the Advisory Committee state that while it would be premature at this stage to draw any final conclusions from the experiment represented by the Horticultural Products (Emergency Customs Duties) Act, they are satisfied that one of the results has been to encourage the home producer to enlarge his operations, and they are impressed by the evidence of the extent to which producers in this country are already making plans to avail themselves of the new opportunity afforded them.

The Committee, however, refer to the tendency of recent agricultural policy to stress the need for improved marketing and say that, in addition to increased production, great importance must be attached to improvements in marketing methods, including the organized assembly, grading and packing of the product. The progress made in this direction will be kept under observation by the Committee in connexion with any further review of the Duties. They conclude that they will not hesitate to recommend the immediate removal of any of the Additional Duties should it appear that, owing to lack of effective organization, or otherwise, the prospect of any particular commodity subject to duty being produced in this country of the right quality in substantial quantities, and at a reasonable price, falls short of what may properly be expected.

The importance attached to improvements in the marketing of agricultural products is significant. Since 1928, National Mark Schemes in respect of various fresh fruits have been initiated by the Ministry with the idea of achieving the objects

on which the Committee now lay particular stress, i.e., organized assembly, grading and packing of the product. Producers have, however, so far taken too little advantage of these schemes, and the total quantity of fresh fruit packed under the National Mark represents only a small proportion of the total production in this country. In view of the Advisory Committee's observations, growers would be well advised to consider the advantages of these schemes and to reflect that inaction may prejudice the interests of producers as a whole.

Leaflets dealing with the various fruit schemes already in operation can be obtained, free of charge, from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1. The extension of the National Mark to fresh fruits not covered by existing schemes, as well as to fresh vegetables, is being investigated, and it is expected that National Mark schemes in respect of a number of these products will be introduced next year.

* * * * *

THE report* of the Interdepartmental Committee on Agricultural Tied Cottages has now been issued. The Committee was appointed in October, 1930, jointly by the Minister of Health and the Minister of Agriculture and Fisheries "to inquire into the conditions of occupation of agricultural cottages in England and Wales which are either let to or provided

for agricultural workers in consequence of their employment, to report upon the present working of the special provisions of the Rent Restriction Acts relating to such cottages, and to make recommendations as to any alterations which may be desirable in the existing law." There are two reports, each signed by three members, together with a statement by the remaining member (Mr. H. H. George of the Ministry of Health) expressing his inability to subscribe to the conclusions and recommendations of either of the other sections. The report signed by Mr. W. R. Smith (Chairman), Mr. G. Dallas and Miss E. Picton-Turbervill expresses the view that it is not in the public interest or in the best interests of agriculture to continue a system such as that of the tied cottage, which undermines the worker's sense of independence and responsibility and gives

* Command Paper 4148, obtainable from His Majesty's Stationery Office, either direct at the following addresses: Adastral House, Kingway, London, W.C.2; 120 George Street, Edinburgh; York Street, Manchester; 1 St. Andrew's Crescent, Cardiff; 15 Donegall Square West, Belfast, price 6d. (post free 7d.), or through any bookseller.

to the employer a power that, whether exercised or not, is one which introduces influences, social and political, quite extraneous to the normal relations between employer and employee. These members, therefore, came to the conclusion that the tied cottage system should, as far as practicable, be abolished. To this end they recommend that from a fixed date every agricultural worker occupying a cottage belonging to his employer should be deemed to be a tenant, the only exception which they are prepared to allow being that of a man in charge of stock breeding. The employer should not be entitled to obtain possession of a cottage unless the existence of suitable alternative accommodation was proved. In so far as the system of granting of certificates under the Rent Restriction Acts is to be continued, this report recommends that the Agricultural Wages Committee should take over from the County Agricultural Committees the functions at present exercised by them in that respect. Miss Picton-Turbervill, however, does not subscribe to this recommendation as in her view there was insufficient evidence adduced to warrant a final recommendation on the point.

On the other hand Viscount Lympington, M.P., Mr. David Black and Mr. J. C. McGrath, in the separate report to which they subscribe, stress the opinion that it is essential to the agricultural industry that the landowner or farmer should have control over the occupation of cottages which have been provided for the use of workers on the farm and which are known as tied cottages. They state that the tied cottage goes far to assure the farmer and worker of housing accommodation, and that to remove this certainty would be of the greatest disservice to farmer and farm worker alike. Referring to the evidence given on behalf of the agricultural workers that the tied cottage gives rise to hardship on the part of the worker, the report states that there appears to be no foundation for stating that such hardships are so numerous or general as to demand any extension of the Rent Restriction Acts or other intervention of the legislature. It is stated that evidence was not lacking that the machinery of the Rent Restriction Acts, so far as the Acts relate to houses in the occupation of farm workers, causes a tendency on the part of such workers to hold over possession of cottages after they had ceased to work on the farm. The members signing this report, therefore, recommend that there should be no extension of the Rent Restriction Acts to agricultural tied cottages and that the conditions of employment that at present exist in the contract of employment between the farmer and the worker should remain undisturbed.

Both reports urge that pressure should be put on local authorities to utilize existing legislation for building houses suitable for agricultural workers. They point out that in the past landowners have been mainly responsible for the housing of the agricultural population, but that it is becoming increasingly difficult for either landowners or farmers to build cottages and that there is general agreement that the responsibility which they have hitherto borne in this respect should now fall upon local authorities or the State.

* * * * *

THIS summer has been far more favourable for the saving of wild white clover seed than that of 1930 or 1931, and a considerable quantity of seed is likely to

Certified Wild find its way on to the market. The
White Clover Seed scheme for the certification of wild white clover, which was inaugurated in 1930, should now begin to bear fruit, for seed that can be certified ought to command a satisfactory price.

This scheme embraces fields in two categories, namely, (a) those that have been down for 10 years or more, and (b) those that have been down less than 10 years, but that were sown with seed taken from 10-year-old fields.

Some of the wild white clover seed on offer will be saved from pastures that are not eligible under the scheme ; and while this seed may be useful for many purposes, particularly for short leys, it should be borne in mind that only seed certified under category (a) above (or eligible to be so certified) should be used by anyone who wishes to lay down a field with the object of the future production of certified wild white clover seed.

Buyers should remember that certificates can be obtained by growers in respect of each seed crop taken from a field that is recorded under the Scheme. These certificates show not only that the field has passed the tests imposed by the Central Wild White Clover Committee of the National Farmers' Union, but indicate also (in the top right-hand corner) the county of production and whether the seed is of Grade A (old pasture) or Grade B (once-grown from old pasture seed).

Not all the registered producers are yet clear as to the procedure they should follow. When a field is "recorded" as eligible under the Scheme, it is given a reference number ; but it is not until a seed crop is taken from that field that a certificate is issued. All registered producers who are harvesting seed this year should write to the Secretary of their County Branch of the National Farmers' Union for the form of application for a certificate.

The Scheme was intended for the benefit of both seed-growers and farmer-buyers. It is to the interest of both parties to take the fullest possible advantage of it. That will only be done if growers secure the certificates to which they are entitled and buyers satisfy themselves—by seeing the certificate, if necessary—that they are getting certified seed.

* * * * *

THE May, 1932, issue of this JOURNAL contained (p. 106) a note regarding certain changes in the scheme adopted in New Zealand for the certification of New Zealand White Clover seed. A letter since received from the Agronomist to the New Zealand Department of Agriculture goes far to remove any ambiguity that might exist in the minds of purchasers in this country as to the scope and effect of the Certification Scheme now operating in New Zealand.

The facts are, briefly, that for some years past the New Zealand Department of Agriculture has been certifying the product from pastures five years old or over as "old pasture seed." The reason has been that the demand was for seed from old pastures, which, it was thought, should prove more permanent than the seed from young pastures. Research undertaken in recent years has shown, however, that the position is not so simple. Some "old pasture" seed certainly produces plants of a very leafy and permanent type; but other pastures are old because conditions have been favourable for re-seeding, and the seed obtained from this type of pasture is not truly permanent. It seems certain that the popularity of New Zealand White Clover is based on the fact that it contains, sometimes in a pure state and sometimes as a blend, a proportion of a certain regional strain.

It is this regional strain, which combines great persistence and winter growth with abundant dense and leafy foliage, that is in future to be certified, since it is believed that this strain is responsible for the overseas demand for New Zealand White Clover.

It is not expected that certification of this particular strain will materially affect the sale of ordinary New Zealand White Clover in the immediate future, but such seed will not be sealed and certified. This distinction is to be reserved for seed of the regional strain, the production of which it is desired to extend, and it is this seed and no other that will be exported in sealed sacks and appropriately labelled in one of the two following classes :—

- A. New Zealand White Clover Certified Mother Seed.
- B. New Zealand White Clover Certified Permanent Pasture Seed.

The position is, therefore, that any seed bearing the New Zealand Government seal and tag will be of this regional strain, and that the name of each of the two classes into which it is subdivided will include the word "Certified."

The letter from the New Zealand Department of Agriculture thus makes it clear that the use of the term "old pasture" has been discontinued because certified seed is now not necessarily harvested from old pasture. It is the strain, and not the age of the pasture, that determines the certification. The Department considered it undesirable to make official use of the term "Wild White Clover" partly because there is no wild or indigenous white clover in New Zealand, partly because the use of such a term might be regarded as an infringement of the right of English Wild White to the use of this distinguishing trade mark, and finally because they wished to reserve the term for use in connexion with "New Zealand-grown Kentish Wild White."

* * * * *

THE report of the Food Investigation Board for 1931* contains a concise account of the progress of the investigations carried out, and the value of the work

Food Investigation can hardly be over-estimated. Dietetic research has shown the importance of freshness in food, and whilst the difficulty of ensuring this freshness in home-grown supplies is by no means negligible in the industrialized conditions of this country, the difficulty is far greater in connexion with the large proportion of the country's food that is imported from overseas and that, sometimes, may be in transit for six or seven weeks. The main objects of the researches described in this report are the improvement in the quality of our food supplies and the prevention of waste before these reach the consumer. The work makes an important contribution to the ideal of providing the community with a food supply not merely adequate in quantity and quality, but the very best that human knowledge and endeavour can ensure. Whilst the work is of primary importance to the consumer, it is also of direct service to the home producer.

* Report of the Food Investigation Board for the Year 1931: Department of Scientific and Industrial Research. (H.M. Stationery Office, Adastral House, Kingsway, London, W.C.1. 1932. Price 5s., post free 5s. 5d.)

The expenditure on these researches is less than £50,000 a year, a sum which represents approximately the cost of one hour's import of foodstuffs into this country, and there can be no doubt that the researches are productive of economies worth many times their cost.

A wide range of experiments covering practically all varieties of foodstuffs is described in the report. The experiments are divided into five sections at the Low Temperature Research Station devoted respectively to (1) meat, (2) fruit and vegetables, (3) pork, bacon and hams, (4) biological engineering, and (5) canning; whilst there is also the work of the Torry Research Station on fish, and that of the Ditton Laboratory on gas storage, as well as extra-mural work carried out at the National Physical Laboratory and the Imperial College of Science and Technology. The report records many advances in the study of the scientific aspects of food storage. Evidence of the general progress of this work is shown in the increased importance now being attached to the more "subtle properties of freshness" in food. Perhaps some of the most interesting of this work is that which deals with the effect of methods of preservation on the vitamins whose presence in food is essential to life. It has been found that the degree of refrigeration applied to apples in store has a varying effect on the vitamin content of different classes of apples. Investigation is also being continued into the new method of "gas storage" of fruit and in particular its commercial application in this country for storing apples. This method involves, in principle, control of the composition of the atmosphere inside the store with or without simultaneous control of the temperature. A large-scale experiment is now in progress at the Ditton Laboratory on the behaviour of selected varieties of apples at different temperatures and in different artificial atmospheres. This work is being extended to pears and bananas. Work on the preservation of vegetables and soft fruits in a frozen state has led to definite results showing, e.g., that raspberries can be stored frozen in the raw state better than any other fruit tested. In the field of canning, problems of corrosion are under investigation.

Work on the storage of brine-frozen fish has been continued. It has been shown that brine-frozen fish are subject to an increasing alteration as the temperature of storage is raised, and that if the benefits of brine-freezing are not to be annulled lower temperatures than those normally used in this country must be adopted. A range of temperatures is suggested to meet the requirements of ships fishing the more distant grounds.

The possibility of importing unsmoked, mild-cured bacon from the Southern Dominions has been explored and found to be impracticable under existing commercial conditions, since the fat becomes rancid after less than two months' storage. On the other hand, carcasses of frozen pork can be successfully transported and used as pork or for the manufacture of bacon, and New Zealand now furnishes larger supplies of frozen pork than any other country in the world.

The work indicated above by no means covers the whole scope of the Board's investigations, which are of so wide a range that only a perusal of the Report can afford a proper appreciation of their importance and application to immediate problems in the commercial handling of foodstuffs. It is of interest to add that the Director of Food Investigation, Sir William Hardy, D.Sc., LL.D., F.R.S., under whose general direction the researches have been carried out, was elected President of the British Association of Refrigeration in March, 1930, and he was re-elected for a further term in March, 1931.

* * * * *

The following note has been communicated by the National Institute of Agricultural Botany: In view of the incidence of the Wheat Act, farmers will want to know how to lay out their money on seed wheat to the best advantage. The trials organized by the National Institute of Agricultural Botany fortunately can give farmers in the Midlands, East and South of England authoritative advice on varieties of wheat, as also of oats or barley. It will pay them best if they make their choice of wheats from among the varieties Victor, Wilhelmina, Yeoman, Yeoman II, Little Joss, Iron III, Weibull's Standard, Rivett and Squarehead's Master. There are three alternatives for barley—the ordinary six-row for exposed situations, and Plumage-Archer or Spratt-Archer for sheltered fields and well-drained soils. Winter oats are a more difficult problem; there is no entirely satisfactory variety, for though Grey Winter, and in slightly less degree Black Winter, can be relied on to survive the winter and give a good yield, they almost always lodge on the richer soils. Bountiful stands better, but it is often damaged by frost, and since the hard winter of 1929 true stocks are difficult to find. Brief particulars of the purposes for which these varieties are adapted are given in Farmers' Leaflet No. 1, issued by the National Institute of Agricultural Botany. Copies can be obtained free of charge from the Institute at Cambridge or from

any County Agricultural Organizer, and inquiries about these or other varieties are always welcome. The fact that a good variety sometimes gives a 20 per cent. better return than a bad one is an unanswerable argument for taking the negligible trouble of consulting the advisory service that has been created for the farmer's benefit.

* * * * *

THE Report on the proceedings under the Diseases of Animals Acts for the year 1931, recently issued,* opens with a retrospect of the position in Great Britain in relation to the problem of the eradication of contagious diseases of animals and other matters coming within the provisions of those Acts, together with some indication of the future outlook.

Part I of the Report describes the present position of the country with regard to animal diseases, and shows that although during the year under review the country continued to be free from certain of the more serious animal diseases such as cattle plague (rinderpest), contagious pleuro-pneumonia, sheep-pox, rabies, glanders, etc., there were also some satisfactory reductions in the prevalence of swine fever, sheep scab and parasitic mange of horses. On the other hand, the Report deals with the widespread invasion of foot-and-mouth disease due to the introduction of infection by consignments of cattle imported from Northern Ireland in June, 1931, which was responsible for the spread of the disease to 39 farms in the North of England and 26 in Scotland. The Report fully describes the details of the energetic measures taken to combat this invasion, including a temporary Standstill Order for the whole of Great Britain and the suspension of the important cattle trade from Ireland—measures that were successful in stamping out the disease within a month.

The usual details showing the results of the administration of the Tuberculosis Order of 1925 by Local Authorities during the year 1931 are also given, with comparative statements for the preceding five years during which the Order has been in operation. The returns show that a considerably larger number of animals were slaughtered under the Order during the year than in previous years.

Part II deals with the measures taken to prevent the introduction and spread of disease in this country. It includes a reference to the embargo placed on animals from Southern

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 2s., or post free 2s. 2d.

Rhodesia in consequence of the outbreak of foot-and-mouth disease in that Colony. Particulars are given of the animals imported from Ireland and other countries and of the cases of disease found in imported animals, the latter including the outbreaks of foot-and-mouth disease introduced from Northern Ireland, as well as cases of tuberculosis in cattle imported from the Irish Free State, and of sheep scab from both Northern Ireland and the Irish Free State.

Part III describes the administration of the measures for the protection of animals and poultry from unnecessary suffering during transit by land and sea, and particularly describes the improvements in the regulations introduced by the Transit of Animals (Amendment) Order of 1931 with respect to the construction of vehicles used for the carriage of animals by road. The records show that the casualties in all classes of the traffic in animals have been reduced to a minimum.

Part IV deals with the certification by the Ministry of animals and animal products for export so as to comply with the regulations of the importing countries. The working of the London Quarantine Station for exported pedigree stock is also described.

Part V contains an account of the meeting in Paris in May, 1931, of the Committee of the International Veterinary Bureau. This Bureau was created with the object of encouraging research in those contagious animal diseases that are of special international importance, and of collecting and distributing data concerning their spread and the steps taken by different countries to combat them and prevent their introduction.

Part VI reviews the work of the Ministry's Veterinary Laboratory and Research Institute at Weybridge, including an indication of the lines of research pursued, the work done in connexion with the diagnosis of certain scheduled diseases, the preparation and issue of vaccines for animals and poultry, and the conducting of agglutination tests of poultry.

The Appendices to the Report contain the usual statistical tables of animal diseases confirmed in Great Britain, the live-stock population, animals imported and exported, numbers and breeds of stock exported with the Ministry's certificates, and the incidence of animal diseases in European countries.

* * * * *

ALTHOUGH the growing of narcissus bulbs on a commercial scale is comparatively a new industry in this country, there exists an extensive literature on the **Narcissus Pests** diseases and pests of this crop, and many practical measures have been devised for their control. It can now be confidently claimed that losses of

bulbs can be very materially reduced by the exercise of reasonable care and the prompt employment of fairly simple measures.

As is usual with scientific writings the results of the many investigations have appeared in the scientific Press and have not been generally available or readily traceable by the commercial growers. To overcome this difficulty and to meet the growing demand for information of a practical nature the Ministry has issued a Bulletin* on the subject. This has been written by Mr. W. E. H. Hodson, the Advisory Entomologist at the University of Reading, who has been engaged for several years on the investigation of bulb pests and whose work is well known to many bulb growers.

In the preparation of this Bulletin emphasis has been placed on points of practical importance and each of the pests usually found has been described and measures are detailed for its control. Special sections are devoted to the control of Bulb Eelworm in the field and to the Hot Water Treatment of bulbs. The publication is well illustrated, both by photographs and coloured drawings.

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THE reduction of weeds is intimately associated with the improvement of grass land, and any means that enable the farmer to reduce weeds, within reasonable limits as regards cost, tend to increase his useful crop. There can be no doubt that there is room for improvement of much of the grass land of this country; probably at least one-half of our permanent grass could be made to double its output within 10 years, and a considerable portion of mountain and heath land, at present used for grazing, could be sufficiently improved to bring about a substantial increase in its feeding value.

It has been estimated that the loss due to the presence of weeds on grass land and the labour expended on cutting them is equal to 7s. 6d. per acre per annum on all the grass land in the country. It is small wonder that the French describe these insidious foes as *mauvaises herbes*; so great a waste invites even stronger terms, and certainly demands strong measures.

The latest of the Ministry's Bulletins† is devoted to this

* Bulletin No. 51, *Narcissus Pests*, obtainable through any bookseller or from H. M. Stationery Office, price 1s. (1s. 2d. post free).

† Bulletin No. 41, *Weeds of Grass Land*, obtainable from any bookseller or from H.M. Stationery Office, price, paper covers 5s. (post free 5s. 4d.), cloth bound 6s. (post free 6s. 5d.).

subject of the control of weeds in grass land. It has been written by Mr. H. C. Long, the author of *Weeds of Arable Land* and *Poisonous Plants on the Farm*, two volumes to which this makes a useful companion. After a general section on the worst weeds of grass land, sections follow on the relation of weeds to soil types; general methods of improvement, such as drainage, liming, the use of chemicals, etc., care in seed growing and the importance of clean seed. The work then deals individually with many species of weeds likely to cause trouble, giving descriptions sufficient for identification and indicating methods of eradication or control.

The Bulletin is profusely illustrated with line, half-tone and coloured plates, so that every assistance is given for accurate identification.

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NATIONAL Rat Week has been fixed this year to commence on Monday, November 7, and the Ministry has again addressed to all local authorities exercising powers under the Rats and Mice (Destruction) Act, 1919, a circular letter inviting their co-operation and urging them to make a special effort during that week to ensure concerted action for the destruction of rats and mice.

The Act requires every occupier of land or buildings to take the necessary steps to destroy rats or mice on his property or to prevent the property from becoming infested. Having regard to the immense amount of avoidable damage caused by these pests, not only in the destruction and contamination of foodstuffs and materials, but as agents and carriers of disease, it is of the utmost importance that local authorities responsible for the administration of the Act should take systematic action in the matter.

In its circular letter the Ministry has invited the attention of local authorities to the need for taking special action relative to any properties in their own occupation—e.g., rubbish tips, sewage farms, sewers, etc.—that may possibly be sources of infestation, and has suggested various means by which the attention of the general public may be drawn to their responsibilities.

The Ministry has also offered to lend to local authorities copies of its cinematograph film, "The Rat Menace," illustrating the life history and habits of the rat and the means available for its destruction. A lecture illustrated by a set of 64 lantern slides on the same subject may also be borrowed.

The Ministry has issued a pamphlet containing a list of firms who supply preparations for destroying rats, together with a few simple suggestions for rat destruction, and it has suggested that local authorities should reproduce the pamphlet for circulation to the general public in their areas. Copies of the Ministry's Advisory Leaflet No. 49 on the "Destruction of Rats and Mice," single copies of which are obtainable free and post free from the Ministry, are also available for purchase by local authorities in bulk quantities at a reduced charge.

Fuller information on the subject is contained in the Ministry's Bulletin No. 30, "Rats and How to Exterminate Them," obtainable through any bookseller, or direct from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, price 6d. (7d. post free).

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THE following note has been contributed by Mr. A. Canham, Secretary of the British National Union :—

A party of 40 farmers, representative **Empire Farmers' Tour in Canada** of Great Britain, Ireland and South Africa, visited Canada during July and August and in the course of their travels spent a most interesting time amongst the settlers of the great wheat-producing provinces, where they received a most hearty welcome. Opportunities were also afforded them of seeing something of the great civic development of such cities as Montreal, Toronto, Quebec and Vancouver, and of admiring the wonderful natural features of forest, lake and mountain scenery with which the Dominion is so richly endowed.

The tour lasted about six weeks, and the itinerary extended from the Atlantic to the Pacific Coasts. Despite the great distances covered, the journey was most pleasant and interesting. Canadian railways are amongst the most efficient in the world and in no part of the Empire are the hotels of higher quality. The two great railway organizations have for many years vied with each other in preparing for that great stream of traffic that everybody in Canada believes will eventually flow in both directions across the Dominion.

Whilst in Ontario, the visitors had an opportunity of inspecting the College of Agriculture at Guelph, where Professor Christie is worthily maintaining the traditions of this great institution. Quite a large number of agricultural students from other parts of the Empire were found to be taking courses here, and amongst South Africans the College is very popular.

Throughout Canada, agricultural education is very highly developed. Each province has its College, as well as one or more Experimental Farms where up-to-date and practical methods are adopted and experiments in crop production carried out. Each institution deals with the more immediate problems of the particular province or district it serves, and the work carried on is most highly spoken of by local farmers. In British Columbia some of these Experimental Farms specialize in dairy stock, and the party was shown remarkable records of milk production. Here, the Holstein (British Friesian) appears to be the most popular breed, although other breeds are favoured—including the Jersey, of which several splendid herds were inspected near Victoria.

Several days were spent in the wheat-growing areas of the Middle West where, at the time, the crop was rapidly approaching maturity and promising a fairly bountiful harvest. The vast stretches of corn lands formed an impressive sight, unrelieved as far as the eye could reach by any other crop except an occasional clover field. During the last two or three seasons the wheat yields have not been too favourable, and as this fact has been concurrent with low prices the lot of the Canadian farmer has not been a happy one. In moving amongst the people, however, one heard very little of their struggles. They are all looking forward to better results this year, and judging from official estimates their hopes are fairly well founded. One thing that impressed the visitors was the spirit of co-operation that seemed to pervade these prairie communities, every section of which, whether bankers, mortgage companies, or farmers, were united in one common effort to weather the rough times they had gone through and were still experiencing.

In these parts, tractors have proved too expensive for the average farmer. Dr. Christie, of Guelph, told the party that, in his opinion, they did not know how to take care of their tools and tractors. They impoverished themselves by taking the line of least resistance, buying new machines on credit rather than repairing their old ones.

At an Experimental Farm in one of the Provinces, the visitors had their first glimpse of the notorious Colorado Beetle. A small patch of potatoes was observed covered with the insects in different stages of development. Spraying is said to be the only remedy for dealing with this pest, which one hopes may never reach the Old Country, where, under the more

temperate climatic conditions, its depredations might possibly be greater than in Canada.

A pleasing item of the tour was the visit to the Prince of Wales's Ranch, some 40 miles from Calgary. Beautifully situated within sight of the foothills of the Rockies, the Prince has established a charming homestead around which have been arranged the lush paddocks for his valuable stud stock of horses, cattle and sheep. The party was shown the pure-bred Arab horses, which are said to thrive exceedingly well in this climate, as do the Dartmoor ponies that His Royal Highness sent out from his Devon farm in order to provide for the children of the district a better type of pony than was formerly available. The experiment has proved successful, and the animals have increased their height by at least a hand under Canadian conditions.

Whilst in Calgary, the party was privileged to witness the great Rodeo, or "Stampede" as it is called in Canada, which is held annually in this old Prairie City. The place was crowded with cowboys and "old timers" from every part of the Dominion, as well as from most of the ranching districts of the United States, and a whole week was devoted to competitions in horsemanship of every possible kind.

On the whole, from a farming point of view, the party was more favourably impressed with British Columbia than with any other part of the Dominion. Here the climate is more temperate, and the crops are more diversified. Its wealth of natural beauty also greatly appealed to every member.

Canada, however, is a great country with unmeasured possibilities. It has been endowed with resources in minerals, in timber and in water equalled by few other countries in the world. It has its drawbacks, but its future, undoubtedly, is assured.

The tour, by the way, was the eighth of the series of Empire Farmers' Visits organized by the British National Union, which owes its origin to the late Sir Pieter Stewart-Bam, and the outstanding purpose of which is to bring the primary producers of the Empire into close personal contact. Since its inception the Union has brought over to the Mother Country many contingents of Overseas farmers and in return has convoyed similar parties to each one of the Dominions. The Canadian visit completed a cycle of the whole Empire. In January next, the Union is taking another party to South Africa, where on a previous occasion both Dutch and English united in according a wonderful reception to the visitors.

The value of these tours, from an Empire point of view, is fully recognized by the Dominion Authorities, whose approval and co-operation is always assured before any tour is undertaken. In Canada, the Prime Minister personally welcomed the party at a luncheon given in its honour, and he expressed a wish that the Union would repeat the visit in the near future. In thanking Mr. Bennett for his hospitality, Mr. Amery, the Chairman of the Union, emphasized the need of unity in Empire agriculture, and added that he knew of nothing that could better achieve this object than inter-Dominion visits of this character.

Just before reaching Canada, the party unanimously selected Mr. D. Crawford, of Hertford, as its leader. Mr. Arthur Canham, the Secretary of the Union, accompanied the party as Tour Manager. (The Offices of the Union are at 213-214 Moorgate Station Chambers, London, E.C. 2.)

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THE possibility of increased plantings of strawberries and other soft fruits, consequent on the imposition of duties on imported fruit, and the growing demands of the canning industry, make it desirable that emphasis should again be laid on the importance of planting only stocks that are healthy and vigorous and true to type.

Before placing orders for strawberry runners and black currant bushes for planting in the coming autumn or spring, growers would be well advised to consult the registers, published by the Ministry, of the names and addresses of growers of strawberry plants and black currant bushes whose stocks have been examined during the past season and certified as true to type, reasonably free from rogues, and, in regard to black currant bushes, apparently free from Reversion.

Copies of these registers may be obtained free of charge from the Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

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AGRICULTURE AND THE OTTAWA CONFERENCE

THE Ottawa Conference met with the main objective of improving trade between various parts of the Empire. The arrangements come to have been embodied in a series of agreements which, subject to ratification by the various Governments, involve certain tariff concessions and other undertakings for the mutual benefit of the Empire as a whole. Provisional Agreements were made between the Government in the United Kingdom and the Governments in Australia, Canada, India, Newfoundland, New Zealand, the Union of South Africa, and Southern Rhodesia. Since the imports from the Dominions to this country consist mainly of foodstuffs, the results of the Conference are of obvious interest to the British farmer.

To gain a general impression of the consequences of the Ottawa Conference to home agriculture, it is important to bear in mind the position as it was before the Conference opened.

The Import Duties Act passed last February imposed a general *ad valorem* duty of 10 per cent. on all foreign imports with certain exceptions which are known as the Free List ; and it exempted all Dominion produce from this general *ad valorem* duty up to November 15, 1932. It also constituted an Advisory Committee, under the chairmanship of Sir George May, which is charged with the responsibility of (1) recommending to the Government additional duties over and above 10 per cent. *ad valorem*, from which Dominion produce is also exempt, and (2) recommending whether commodities should be taken off or put on the Free List.

This Committee had already made recommendations, which the Government subsequently sanctioned, involving additional duties as far as agriculture is concerned, mainly on horticultural produce. It had not, however, dealt with such commodities as grain, meat or milk products generally. Imported supplies of fresh vegetables and certain fruits came principally from the Continent, whereas the other commodities are derived not merely from foreign countries, but to a considerable extent from Empire countries. For this reason, it was desirable to postpone the question of any additional duties on agricultural products until the meeting of the Imperial Conference.

The principal results of the arrangements entered into at Ottawa, which affect home agriculture, may be summarized as follows: First, agreement to continue free entry of Dominion produce after November 15, 1932 ; secondly, agree-

ment to maintain, as a minimum, the 10 per cent. *ad valorem* duty on a wide range of foreign imports; thirdly, agreement to impose certain additional duties on foreign agricultural products over and above the 10 per cent. duty; and fourthly, special arrangements in regard to meat.

The period of free entry for Dominion produce is extended from November 15 for the duration of the agreement (usually at least five years). This is subject, however, to a reservation in regard to eggs, poultry and milk products under which the United Kingdom Government retains the right, after the expiration of three years, to place restrictions, either by tariffs or by the regulation of the imports, on Dominion as well as foreign produce, in the interest of the home producer.

The undertaking to maintain at least the 10 per cent. *ad valorem* duty on foreign imports during the currency of the agreement applies to the commodities specified in the schedules; but the agreements also expressly make provision for the imposition of additional duties or alterations in duties on certain agricultural products imported from foreign countries. For example, the duty on butter is to be increased to 15s. per cwt. while that on cheese is to be raised from 10 per cent. to 15 per cent. *ad valorem*. Apples and pears are to be charged with duty at the rate of 4s. 6d. per cwt., while upon eggs in shell the duty will vary from 1s. to 1s. 9d. per great hundred, according to weight.

Another example is the case of milk products. Condensed milk (whole) will be subject to a duty of 6s. per cwt. in the case of unsweetened and 5s. per cwt. plus the sugar duty in the case of sweetened. A number of other agricultural products, including canned fruits and dried fruits, are made subject to special rates of duty.

In addition to the above, the most important outcome of the Ottawa Conference affecting domestic agriculture is the agreement relating to meat. The live stock industry in this country as well as in the Dominions has suffered acutely by the fall in prices, particularly in the case of sheep and pigs, and it was with the object of assisting farmers both here and in other parts of the Empire that the provisions relating to meat were drawn up.

The general principles of the arrangement in regard to meat are typified in the agreement entered into between the United Kingdom and Australia, which provides, not for the imposition of a tariff on meat, but for the quantitative regulation of imports entering this country. Particulars of the scheme are given in Schedule H of the draft agreement. It involves, on

the one hand, an undertaking by Australia to limit the export of frozen mutton and lamb to the United Kingdom for the year 1933 to an amount equivalent to the total imports from Australia during the year ended June 30, 1932, and, on the other hand, an undertaking by the United Kingdom to regulate the importation of foreign meat in accordance with a certain programme and including within its scope frozen mutton and lamb, frozen beef and chilled beef. There is also a provision for the regulation of imports of bacon and ham entering the United Kingdom, such regulation to be applied as soon as practicable after the report of the Reorganization Commission on the pig industry, now sitting, has been received.

Provision is also made for consultation between the United Kingdom and Australia for the purpose of ensuring an improved price situation in regard to meat and the more orderly marketing of meat supplies, and for the continuance of control during the period of the Ottawa agreement, but subject to the right of the United Kingdom Government to remove restriction on imports of foreign meat should supplies, in consequence of such restrictions, be inadequate to meet consumers' requirements.

Such are the main results, so far as they affect home agriculture, of the agreements entered into at Ottawa, and which now will be submitted to the respective Governments for ratification. Further details are to be found in the published texts. The only other subject that need be mentioned here is that the agreement between the United Kingdom and Canada provides for the modification of the existing restrictions on the importation of Canadian cattle into the United Kingdom and of pedigree stock from the United Kingdom into Canada.

A word must be said about the duration of the Agreements. With the exception of India, the Agreement with whom is not of great importance from the point of view of home agriculture, they are for a period of five years certain and, thereafter, terminable upon six months' notice. This means that in the case of those commodities in which existing preferences will be continued the Government of this country has undertaken to maintain a minimum duty of 10 per cent. *ad valorem* on imports of certain foreign agricultural products. The result of this is that agriculturists at home have now a certain knowledge that, when legislative effect is given to the undertakings entered into at Ottawa, for a considerable period the duties specified in the Agreements will not be reduced.

NOTE.—For further particulars of the Agreements between His Majesty's Government in the United Kingdom and the

Governments of Australia, Canada, India, Newfoundland, New Zealand, The Union of South Africa, and Southern Rhodesia, respectively, reference should be made to the issue of *The Board of Trade Journal* for August 25, 1932 (H.M. Stationery Office, price 6d. net, 7d. post free).

BLOSSOM WILT OF FRUIT TREES

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BLOSSOM Wilt has been very prevalent this year and, in some plantations and orchards, trees that flowered freely, and so gave promise of heavy crops, had their blossom destroyed to such an extent that the resulting crop was exceedingly poor, in some instances reduced almost to nil.

Despite the fact that the cause of Blossom Wilt has been known for many years, there are still a number of experienced fruit growers who are ignorant of the factors that conduce to destructive outbreaks, proved by the many inquiries received this year at East Malling and elsewhere concerning this disease in plum, cherry and apple trees. Moreover, certain ornamental species of *Prunus* and *Pyrus* have suffered from the same disease.

Even at the present time, Blossom Wilt is considered by some growers to be due to late frosts and they remain sceptical when told that it is caused by a parasitic fungus. Experiments have shown, however, that typical Blossom Wilt can be induced (by inoculating the flowers with spores of the fungus) under greenhouse conditions where the temperature during the experiments has never approached freezing point. Meteorological conditions, however, cannot be wholly ruled out, for it has been observed that Blossom Wilt is most severe in seasons when there is cold wet weather at the time the fruit trees are in bloom, as in the spring of 1932.

It seems necessary, therefore, that fruit growers should be reminded of the true facts of the case, for, if the weather conditions are again favourable for the fungus next year, and if no precautions are taken in the meantime to guard against the ravages of the fungus, there will probably be another severe outbreak in 1933.

Blossom Wilt of fruit trees in Europe (including the British Isles) is caused by the fungus *Sclerotinia cinerea*.* The

* A distinct but closely related fungus, *Sclerotinia americana* (also known as *S. fructicola*) causes blossom wilt (and fruit rot) of peaches, plums and cherries in America, Australia and New Zealand.

Sclerotinia (ascigerous) stage of this fungus has rarely been seen, however, and its *Monilia* (conidial) stage is the one that is seen on flowers killed by this fungus. In fact, the ascus-producing stage is unnecessary for maintaining the existence of the fungus from one season to the next.

In Blossom Wilt the infection takes place through the flowers, in most cases after they have expanded, and usually by way of the stigmas, although in Morello cherries infection through unopened flowers also has been observed. The spores germinate on the stigma of the open flower; the germ tubes grow slowly down the style into the ovary and thence into the flower stalk. From the flower stalk the fungus extends into the tissues of the axis of the inflorescence or flowering spur and then all the leaves and flowers of the spur suddenly flag and soon wither.

The progress of the infection is slow at first and frequently a week or more elapses before the fungus enters the flower stalk. Progress is then more rapid and in certain experiments it has been observed (as shown by the progressive discoloration down the stalk) that the fungus travels along the flower stalk about one centimetre a day. In such experiments, where one flower only of a truss has been inoculated, the time that has elapsed between the inoculation of the stigma and the wilting of the whole truss has usually been about a fortnight. This period corresponds to what may be observed in natural infection; trees come into flower, often with a fine show of bloom, and then, about a fortnight later, many of the trusses wilt and are soon brown and withered. The actual wilting on any particular tree thus takes place almost simultaneously on all the branches, and in two or three days the appearance of a severely infected tree is completely changed. This has led growers to infer that the trees have been struck by frost, especially as low temperatures at night are by no means uncommon at that time of the year.

The fungus permeates the tissues of the infected organs and in wet weather it comes to the surface as a grey mould on the flowers and flower stalks, producing its fructifications in the form of cushion-like tufts; these develop numerous spores that are set free into the air and carried about by the wind.

Morello Cherries.—When a cluster of flowers and leaves is killed, the further progress of the fungus varies somewhat with the host plant attacked. In the Morello, and other acid

cherries, in which the flowers are borne at the nodes of the one-year-old twigs, the infection passes directly from the flowers into the twigs, with the result that these are killed above the nodes where infection occurred. Thus, in Morellos, Blossom Wilt infection is characterized by the death of a number of flowering twigs. In severe infection, the whole of the blossom of a Morello tree may be destroyed in this way, by direct infection of some clusters and by the wilting of others as a result of infection of flowers lower down the twigs. In some seasons infection of unopened flowers of the Morello has been observed. Thus in 1931 there was severe infection in some plantations of Morellos when the flowers were in bud and again when the flowers opened. This year there has also been severe infection of Morellos in places, and the writer has received specimens not only from localities in the South of England but also from Ireland* ; in every case examined in 1932, however, the fungus had entered through the open flowers.

Sweet Cherries.—In sweet cherries, on the other hand, where the flowers are borne on spurs on the older parts of branches, the spurs are killed, without, as a rule, the branch itself being killed. In some seasons, however, the destruction of the flower trusses may be sufficiently severe to cause considerable reduction in the crops. In May, this year, some large trees in North Kent had at least half the blossom trusses killed by infection with *Sclerotinia cinerea*.

Plums.—In plums, the smaller twigs are sometimes killed following Blossom Wilt ; generally the damage to the trees themselves, apart from the blossom, is not severe although the blossom on neglected trees, in certain seasons, may be almost, if not entirely, destroyed. In a plantation near Canterbury, President plum trees this year had bloomed profusely, but by the middle of June, when seen by the writer, nearly all the blossom had withered ; in fact, on some trees not a single set flower was to be found. Other plum trees, Czars, on a neighbouring plot, were almost as severely affected. An examination of the trees showed that there had been a little infection the previous year, for there were old dead twigs and spurs bearing the fructifications of the fungus. The damage that year (1931), however, was not enough to cause any alarm ; thus no particular notice had been taken of it

* The writer is indebted to Mr. A. E. Muskett, M.Sc., of Queen's University, Belfast, for specimens received from Northern Ireland.

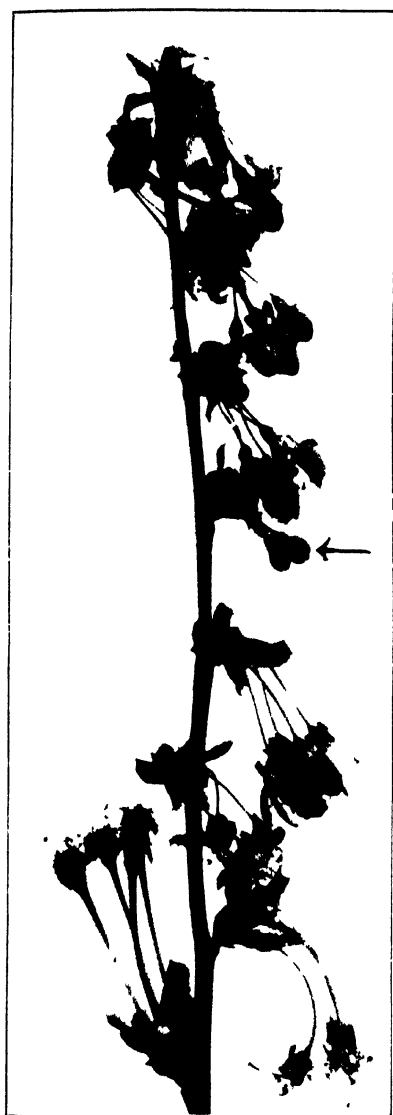


FIG. 1. Twig of Maricle cherry killed by infection through the unopened flowers indicated by the arrow.



FIG. 2. The cordon of a Cox's Orange Pippin cordon tree killed by infection of the truss of flowers opposite the star.

PLOSSOM WILT OF FRUIT TREES

and no precautions were taken against future infection. The result was that, in 1932, when the weather conditions were particularly favourable for the fungus at the time the trees came into flower, those sources of infection were sufficient to cause damage on a large scale.

On plum trees, such blossom infection is often accompanied by wither-tip, when the fungus infects the leaves of the young shoots, and, advancing into the shoots themselves, causes these to wilt and finally wither. Such withered twigs, if allowed to remain on the trees, also serve as sources of infection the following year.

Peaches and Apricots.—Peaches and apricots, too, suffer from infection of the flowers. In peaches, where the flowers are borne on the young twigs, the latter become invaded from the flowers, as in Morello cherries, and are killed.

Apples.—The numerous inquiries that have been made this season concerning Blossom Wilt in apple trees, particularly the very susceptible variety Lord Derby, show that infection of apple flowers has been exceptionally severe in 1932. On neglected trees, 50 per cent. or more of the flowering spurs have been destroyed, and this is not the worst, for the fungus often extends from the spurs into the branches to cause cankers, which, when they girdle, kill those parts of the branches above the cankers. On cordon trees, blossom infection and the resulting cankers may cause the death of the upper part of the "leader," as shown in Fig. 2.

The severity of the infection in Lord Derby and Cox's Orange Pippin, in 1932, is shown by the following extracts from letters received from growers:—

The secretary of the Wisbech and District Fruitgrowers' Association writes: "With regard to the Blossom Wilt which we noticed to be so prevalent this year, especially among Derbys, I have had one or two reports with regard to its being prevalent in other districts." Mr. G. C. Johnson, Horticultural Superintendent for East Sussex, sent specimens with the information: "Shoots out from the apple variety Cox's Orange Pippin. The trees are full of such dead shoots." Later Mr. Johnson wrote: "Almost every apple tree in East Sussex that has flowered this spring is affected with Blossom Wilt. It is possible to see, from 300 yards, the brown effect of the disease (in some cases it looks as if the trees had had a fire lighted beneath them). Trees standing near which did not flower are showing no sign of trouble." A grower in the Weald of Kent, writing of his Lord Derby trees, says: "About four of my trees are practically dead with it"; and another Kentish grower writes: "I have a very bad attack of apple blossom wilt in my Lord Derby plantations this year. This is a serious matter for the farm, as the apples form the main crop and I am afraid it means very considerable damage to the trees as so much wood has to be cut out."

In recent years (until 1932) Blossom Wilt of apples has not been very prevalent. Serious outbreaks occurred in 1916 and 1917, when the disease was investigated and its cause fully established. An illustrated account of those outbreaks, with recommendations for the control of the disease, was published in this JOURNAL in August, 1917, page 504. Since that time, occasional complaints have been received from growers concerning Blossom Wilt of apples, but apparently no great damage was caused until this year.

There can be no doubt that the reason why Blossom Wilt of apples was so severe this year in some plantations is that there was comparatively little in 1931, so that it was looked upon as negligible. The infected spurs left on the trees, however, served as sources of infection this year, when the conditions, at the time of blossoming, were particularly favourable for the fungus, the cold, wet weather in May causing the flowers to remain open, not setting (and therefore liable to infection) for a comparatively long period, such conditions being favourable for the fungus to produce and scatter its spores.

It has been shown by the writer, and confirmed by Boyle, Murphy and Cummins* in Ireland, that the fungus that causes Blossom Wilt in apples is "biologically" different from that of stone fruits, for attempts to induce the disease in apple blossom failed when the flowers were inoculated with the fungus taken from plums and cherries. The apple blossom fungus is therefore looked upon as a distinct "biologic form" and has been named *Sclerotinia cinerea* forma *mali*, to distinguish it from *S. cinerea* forma *pruni* of plums and cherries.

Pears.—A blossom wilt of pears caused by *S. cinerea* forma *pruni* has occurred in Kent and in Sussex on Fertility pear trees, but it has not been reported in recent years and it appears to be uncommon.

Blossom Wilt and Fruit Rot.—The Blossom Wilt fungus not only infects the flowers but it may also produce a fruit rot. On apples and pears, fruit rot caused by *S. cinerea* is rare; the common brown rot of these fruits is brought about by the related fungus *S. fructigena*. On plums and cherries, however, *S. cinerea* (as well as *S. fructigena*) is a common cause of brown rot of the fruit.

Control.—On the infected flowers, shoots, and fruit the fungus produces its *Monilia* fructifications which serve to

* *Scien. Proc. Royal Dublin Soc.*, Vol. 19 (N.S.), 1928, pp. 63-76.

spread infection during spring and summer. It passes the winter within the tissues that it has killed (flowers, leaf-stalks, spurs, cankers and mummified fruit) and early the following year it reappears at the surface in the form of small grey cushion-like fructifications that produce innumerable spores ready to infect the flowers as they open.

It follows that the most rational way of controlling Blossom Wilt is to remove all sources of infection by cutting out infected spurs, twigs and branches and burning them. In some instances, this can be done without any special difficulty, especially if the grower realizes that he must not wait for a year when an epidemic of infection occurs before he takes steps to guard against it, but must examine his trees in years of little infection also, when the operation of cutting out is light.

In Morello cherries and apples, especially when grown as bush trees, cutting out the infected parts should be looked upon as one of the routine practices on a fruit farm, and it should be done as soon as possible after the wilting has been observed, for then the dead spurs and twigs can be most easily seen. If the operation is left until winter, it is probable that many will be overlooked.

In plums and sweet cherries, this removal of dead wood is usually a more formidable task; to cut out the numerous dead spurs and twigs on large standard cherry and plum trees is generally regarded as impracticable, but it should be noted that such severe infection as was experienced this year is usually a result of neglect. If such an operation is carried out every year, as a matter of course, there will be little to cut out in years of slight infection, and it will ensure against the destruction of the crop when a "brown rot year" comes round.

Spraying to protect against Blossom Wilt has not, generally, yielded the desired results, although some degree of control has been obtained. A caustic wash, consisting of 10 lb. caustic soda and 10 lb. of soft soap in 100 gal. of water, applied just before the buds begin to swell, has been tried with some success. In trials, carried out by Lees and Briton-Jones* at the Long Ashton Research Station, a tar-oil winter wash reduced infection on plum trees. In 1906, Professor Salmon† of the South-Eastern Agricultural College, Wye, prevented infection in Morellos by spraying the trees

* *Jour. Pomol. and Hort. Sci.*, Vol. IV, 1925, pp. 196-199.

† *Jour. S.E. Agric. Coll.*, No. 16, 1907, pp. 283-286.

with Bordeaux mixture just before and again immediately after flowering, and certain observations made this year suggest that lime-sulphur, applied to cherries just as the trees come into flower, may also reduce Blossom Wilt.

In applying a winter wash, the aim is to destroy the fungal fructifications that develop on the parts killed in the previous year. Such a wash should be applied as late as possible, but not so late as to cause any spray injury.

For the control of Blossom Wilt, therefore, infected parts should be cut out whenever this operation is at all possible ; when it cannot be done, a winter wash should be tried, or the trees should be sprayed with Bordeaux mixture or lime-sulphur just as they come into flower.

As the Blossom Wilt fungus infects fruit also, causing them to become mummified, it is necessary that such mummified fruit should not be allowed to remain on the trees through the winter. It is deplorable that bunches of these " mummies " are still often to be seen in plum plantations and cherry orchards.

Summary.—Attention is drawn to the severe outbreaks of Blossom Wilt (caused by the fungus *Sclerotinia cinerea*) which occurred in 1932 on cherry, plum and apple trees, resulting in a serious reduction in the crops.

The causes which lead up to such outbreaks are discussed, and measures for preventing epidemics of Blossom Wilt are recommended.

Stress is laid on the routine cutting out of brown rot cankers and of all infected spurs and twigs.

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REPORT ON THE WORK OF THE EDUCATION AND RESEARCH DIVISION OF THE MINISTRY FOR THE YEAR 1930-31*

PART II.—AGRICULTURAL EDUCATION

THE types of agricultural education provided in this country fall into two main classes, (a) higher education, suitable for landowners, the larger farmers, estate managers and professional workers, which is provided by University Departments of Agriculture and Agricultural Colleges; (b) less advanced instruction, suitable for the smaller farmers, bailiffs, smallholders, agricultural workmen and the wives of such men, which is provided by County Councils.

The Ministry's function is to assist and co-ordinate these activities. It has no power to compel a University or a County Council to provide agricultural education; but by financial aid it can do much to help the Universities, Colleges and Local Authorities in meeting the educational needs of the agricultural community, and through the "power of the purse" it can, where necessary, exercise influence upon them. It is, however, its deliberate policy to interfere as little as possible with local autonomy; in the main it leaves to the appropriate authorities the responsibility for formulating and conducting schemes of instruction and advice, as local circumstances may require.

In higher agricultural education the academic year 1930-31 was marked by no notable event except the financial crisis towards its end. That crisis has compelled a general reduction of State grants to the University Departments and Colleges, and the postponement of all new developments, including the grant promised for the reconstruction of the Royal Veterinary College. Further reference to this last matter will be found later in this Report.

In the less advanced instruction provided by County Councils the year 1930-31 was a period of moderate expansion. The Annual Report of the Education, etc., Division of the Ministry for the year 1929-30 described briefly the effort of the Ministry to enlarge the scope and increase the efficiency of county agricultural education, and indicated the results of that effort. The total results (including those of the year now under review) were that County Council staffs were strengthened by

* Continued from p. 536 of the issue of this JOURNAL for September, 1932.

the appointment of additional instructors, minor extensions were carried out in a number of Farm Institutes, a certain number of additional scholarships were provided, and there was some increase in the other activities of the County Councils, such as organized courses of instruction, advisory work, egg-laying trials, clean-milk competitions, and demonstration plots. In the summer and autumn of 1931 the financial crisis necessarily suspended further development, and the Ministry was compelled to notify the authorities not merely that all expansion must cease, but also that as from October 1, 1931, the Ministry's grants in aid of County education would be reduced to a uniform rate of 60 per cent.

After these few remarks, the work of the year may be reviewed under the following headings :—

(A) Higher Agricultural Education at Universities and Agricultural Colleges.

(B) Agricultural Education provided by Local Authorities.

(C) Dairying.

(D) Poultry and Small Livestock.

(E) Miscellaneous :—

- (1) Scholarships for the Sons and Daughters of Agricultural Workmen and Others ;
- (2) Young Farmers' Clubs ;
- (3) Sugar-Beet.

(A) Higher Agricultural Education at Universities and Agricultural Colleges : Maintenance Grants.—The Ministry aids universities and colleges that provide higher agricultural education, by means of block grants, fixed normally for periods of five years. The reassessment of these grants was due to take place for the academic year 1930–31, and a small Committee, with the Parliamentary Secretary of the Ministry as Chairman, was appointed in 1930 to review the work of the institutions and to recommend rates of grant for the ensuing period. For various reasons this Committee found itself unable to report until the summer of 1931, and it was accordingly arranged that for the academic year 1930–31 the then existing grants should be continued, with one exception. The grant to the Royal Veterinary College was increased from £3,300 to £5,150, as an interim measure, mainly in order that certain urgently needed increases of salary might be accorded to some members of the staff.

The following table gives particulars of the actual grants paid in respect of the academic years 1929–30 and 1930–31 :—

<i>Institution</i>	<i>Grant in respect of academic year</i>	
	1929-30	1930-31
	£	£
Armstrong College, Newcastle-on-Tyne	3,500	3,500
Cambridge University, School of Agriculture	6,500	6,500
Harper Adams Agricultural College	4,000	4,000
Leeds University	3,800	3,800
Liverpool University (Veterinary Department)	2,850	2,850
Midland Agricultural College	3,000	3,000
Oxford University, School of Rural Economy	4,000	4,000
Reading University	4,000	4,000
Reading University, British Dairy Institute	900	900
Royal Agricultural College, Cirencester	3,000*	2,000
Royal Veterinary College	3,300	5,150
South-Eastern Agricultural College, Wye	4,000	4,000
Seale-Hayne Agricultural College	2,300	2,300
Studley College	1,000	1,000
Swanley Horticultural College for Women	1,750	1,750
University College of Wales, Aberystwyth	7,000	7,000
University College of North Wales, Bangor		

* A special grant of £1,000 was made to the Royal Agricultural College, Cirencester, for the academic year 1929-30 over and above the ordinary grant of £2,000, to assist the College in making provision for short courses and providing accommodation for short-course students.

Grants of £2,741 and £2,650 were also paid to the National Institute of Poultry Husbandry in respect of the financial years 1929-30 and 1930-31, respectively.

The report of the Block Grants Reassessment Committee was received in August, 1931, but while it was under consideration the situation was completely altered by the financial crisis. The rates of grant ultimately settled for the ensuing academic year reflected the change in circumstances; every institution suffered a reduction of grant, the amounts deducted aggregating about 5 per cent. of the grants actually paid for the preceding year. For the present, owing to the exceptional financial situation, the grants will be fixed from year to year; but it is hoped to revert to the quinquennial basis as soon as the position becomes more stable.

Capital Grants.—In addition to the grants detailed above in aid of the annual maintenance expenditure of the colleges, payments were made to certain colleges in respect of capital expenditure on the improvement or extension of the college premises and equipment. The principal sums so paid in 1930-31 were as follows :—

Liverpool University.—In 1924, a grant of £15,000 on a £ for £ basis was sanctioned in aid of improvements to the School of Veterinary Science attached to the University. The whole scheme was estimated to cost £30,000, but it has not yet been possible

to carry it out in full. The sum of £953 paid during 1930-31 completed a total of £10,158 representing the Ministry's contribution in respect of such part of the work as had been done up to that date.

Reading University.—A grant of £500 was paid towards the cost of purchase of additional land.

Seale-Hayne Agricultural College.—An instalment of £794, out of a total grant of £1,400, was paid in respect of an extension to the new dairy.

Studley College.—Comprehensive proposals for the improvement and extension of the College buildings and equipment were considered in 1930 and 1931, but for financial reasons no assistance could be promised. A small grant of £445 was, however, sanctioned in respect of poultry equipment that was urgently required, and an instalment of £417 was paid during the year.

In the previous Report it was indicated that, owing to the financial crisis, it had been found necessary to postpone the grant of £150,000 that had been sanctioned for the purpose of rebuilding the Royal Veterinary College. In the meantime, the Governors are proceeding with portions of the work out of funds available from other sources.

Students.—The numbers of students attending courses at institutions for higher agricultural education during the past five years have been as follows:—

1926-27	..	..	..	..	..	1,977
1927-28	..	..	..	..	..	1,863
1928-29	..	..	..	..	..	1,957
1929-30	..	..	..	..	..	1,896
1930-31	..	..	..	..	..	1,948

An analysis of the returns reveals that of 2,007 courses attended by the 1,948 students referred to above, 1,039 were agricultural courses, 302 horticultural, 232 dairying, 109 poultry husbandry, and 276 veterinary science. The duration of the principal courses varies from one to four years.

Although the total number of students is slightly in excess of that for the previous year, the returns for a few of the individual colleges show a decline. In nearly every instance, however, the reduction is in the number of students attending short courses which are more or less comparable in character with those held at county farm institutes, and the decline may well be due to the growing popularity of the institute courses. The numbers of students taking two- and three-year courses leading to a degree or diploma in agriculture, horticulture, dairying or poultry keeping all show a slight increase on the previous year. The special popularity of the veterinary courses (noticed in the Report for 1929-30) is again maintained, the number of students having risen from 227 to 276.

(B) Agricultural Education provided by Local Authorities.—The local authorities in receipt of aid from the Ministry under

its "Regulations for Grants in Aid of Agricultural Education in England and Wales" are the councils of counties and county boroughs. The Ministry's grants are based on a percentage of the actual net expenditure approved by the Department and charged to the higher education account of the authority. Up to September 30, 1931, the rate of grant in respect of the salaries and expenses of certain officers to whose duties special importance was attached (*viz.*, agricultural organizers and certain horticultural superintendents) was 80 per cent. of the net expenditure, and in respect of all other approved annual expenditure, 66½ per cent. Capital expenditure on the provision, equipment or alteration of a farm institute was normally aided at the rate of 75 per cent., either by way of capital grant or by contributions to the annual loan charges if the expenditure was met by loan. As from October 1, 1931, however, all these rates have been reduced to a flat rate of 60 per cent. For the present no capital grants can be sanctioned save in exceptional cases where small sums are urgently required for the maintenance of existing work.

The method of local administration of schemes of agricultural education varies. During the year in question the responsibility in 23 counties rested with the Agricultural Committee under orders made under Section 7 (2) (i) of the Ministry of Agriculture and Fisheries Act, 1919. With the exception of Devon, whose Agricultural Committee has retained direct control of agricultural education, the duties have in each case been delegated to an agricultural education sub-committee, on which the Minister of Agriculture and Fisheries is empowered to nominate one-third of the members. In Berkshire, Hampshire and Lincoln (Holland), there are agricultural education committees which report direct to the County Council, and are independent of the Agricultural Committee and the Education Committee. The three Ridings of Yorkshire have entrusted the care of agricultural education to a joint body called the Yorkshire Council for Agricultural Education. In all other counties it comes under the charge of the Education Committee, acting, in most cases, through an agricultural education sub-committee.

The table (top of page 632) shows the maintenance expenditure on agricultural education by the counties, and the amount of grant provided by the Ministry during the past eight years.

The considerable increase in expenditure in 1930-31 was due to the special efforts made in 1929 to improve and extend the services provided by the county authorities.

Year	Expenditure			Grants		
	England	Wales	Total	England	Wales	Total
	£	£	£	£	£	£
1923-24 ..	188,228	35,783	224,011	125,291	24,823	150,114
1924-25 ..	227,923	36,915	264,838	152,158	25,640	177,798
1925-26 ..	260,404	47,069	307,473	174,156	32,444	206,600
1926-27 ..	272,777	47,246	320,023	182,015	32,590	214,605
1927-28 ..	265,705	45,664	311,369	177,989	31,529	209,518
1928-29 ..	255,948	41,513	297,461	171,569	28,767	200,336
1929-30 ..	261,838	40,614	302,452	175,480	28,175	203,655
1930-31 ..	319,275	49,570	368,845	213,842	33,664	247,506

Capital Grants to Counties were also made during the year in a few instances. £1,247 was paid to the Kent County Council in respect of part of the cost of adapting Borden Grammar School for the purpose of a farm institute, and a final instalment of £547 was paid to the Hants County Council on account of the cost of alterations and additions to the hostels at Sparsholt.

Grants of £224 and £216 were made in respect of expenditure on the installation of central heating at the Madryn Farm Institute (Caernarvon) and the Llysfasi Farm Institute (Denbigh), respectively. Finally, a sum of £900 was paid to the Carmarthen County Council in aid of additions (mainly the erection of a house for the Principal) at the Pibwrlwyd Farm Institute.

Maintenance grants are also paid to non-county authorities in respect of work carried out in urban areas, consisting mainly in the provision of advice and instruction on horticultural matters. The following grants have been paid during the past seven years :—

	£			£
1924-25 ..	881	1928-29 ..	1,700	
1925-26 ..	938	1929-30 ..	1,715	
1926-27 ..	1,335	1930-31 ..	1,755	
1927-28 ..	1,457			

Courses of Instruction.—The tabular statement (top of page 633) gives the particulars of the courses of instruction, lectures, etc., arranged by local authorities during the past five years.

This table indicates that the extension of county work noted in 1929-30 was continued in 1930-31. There was an all-round increase in the number of courses provided, except in the case of correspondence courses and manual processes, and in the number of students, except in the case of the correspondence courses.

	1926- 27	1927- 28	1928- 29	1929- 30	1930- 31
Farm Institute, etc., Courses:					
No. of courses	105	94	87	102	111
No. of students	910	995	950	1,120	1,415
Organized Day Courses :					
No. of courses	318	291	323	317	330
No. of students	3,464	3,244	3,208	3,335	3,766
Evening Classes :					
No. of courses	315	337	320	378	424
No. of students	7,041	7,420	7,204	8,976	9,819
Correspondence Courses :					
No. of courses	9	11	11	9	4
No. of students	62	131	145	208	111
Instruction in Agricultural Manual Processes :*					
No. of courses	353	365	398	440	421
No. of students	2,985	2,964	3,432	3,503	3,795
Lectures, Demonstrations & other Meetings :					
No. of meetings	9,544	9,914	9,364	10,185	11,281

* Ploughing, hodge-laying, ditching, thatching, sheep-shearing, basket-making, hurdle and spar-making, milking, etc.

This organized instruction forms, however, a part only of the duties of the county agricultural education staffs. In many counties there is a farm institute for the general management of which the county staff are responsible, and in most there are practical activities such as experimental and demonstration plots, county egg-laying trials and clean-milk competitions. Moreover, the county staffs, in addition to such regular activities, are required to act as advisers to agriculturists in their area on technical questions, and to answer an ever-growing number of inquiries either in person or by correspondence; often it is found that an inquiry can only be satisfactorily answered after a visit to the farm concerned. These and other miscellaneous duties entail heavy calls on the time and energies of the county staffs. The steadily increasing volume of inquiries directed by farmers to the county offices is the best proof of the value of the assistance so provided for the agricultural community.

Scholarships.—During the year 1930-31 county agricultural education authorities awarded 1,841 scholarships at a total cost of £19,919; for the previous year the corresponding figures were 1,510 and £18,699.

Staff.—426 whole-time instructors and instructresses were employed by local authorities, as compared with 421 in the previous year. All counties, with the exception of Huntingdon-

shire and the Isle of Ely, now have an agricultural organizer for the direction of agricultural education.

The following list indicates the numbers of each type of instructor employed :—

Agricultural Organizers	55	in 57 counties
Agricultural Instructors (in general agriculture, economics, chemistry, biology, mycology, etc.)	112	„ 36 „
Horticulture	95	„ 53 „
Dairying	62	„ 37 „
Poultry-keeping	65	„ 47 „
Dairying and Poultry-keeping (combined)	13	„ 12 „
Farriery	3	„ 3 „
Bee-keeping	4	„ 4 „
Veterinary Science.. .. .	4	„ 4 „
Farm Accounting	3	„ 3 „
Rural Domestic Economy (Fruit Preservation, etc.)	3	„ 3 „
Manual Processes (hedging, ditching, pruning, grafting, woodwork, etc.) ..	6	„ 6 „
Agricultural Engineering.. .. .	1	„ 1 „

In addition, part-time instructors are employed to deal with such subjects as veterinary hygiene, bee-keeping and agricultural manual processes.

(C) **Dairying.**—Before turning to details of the work in dairying during the year 1930-31, it may be useful to mention very briefly three matters of importance to the progress and prosperity of the industry. First, the payment of a bonus by distributors for milk of high hygienic quality extended during the year. Secondly, there has been a considerable development of the movement known as the “Milk in Schools” movement. For the quarter ended March 31, 1931, more than 600,000 children were receiving milk daily under this scheme ; and the number has grown considerably since then. Thirdly, the experimental scheme for the establishment of county registers of accredited milk producers, which was mentioned in the Report for 1929-30, is proceeding in four counties, and gives indications that it may be useful in facilitating bonus payments by the distributive trade for milk of high hygienic quality.

Courses of Instruction.—Nearly 3,000 students were registered as attending during 1930-31 courses of instruction in dairying—an increase of more than a thousand over the previous year. These courses include farm institute courses, travelling schools in butter- and cheese-making, co-operative cheese schools and classes for milkers. In addition, it is estimated that about a thousand students received some instruction in cheese-making at farms visited by the county instructors for short periods (one to three days).

Clean Milk Competitions.—The following table gives the detailed returns of the clean milk competitions held by local authorities :—

<i>Clean Milk Competitions</i>	1929-30*	1930-31
No. of authorities holding competitions .	30	37
No. of competitors . .	954	1,149
No. of cows included . .	25,283	28,888
No. of samples examined . .	7,881	9,067†
No. of samples reaching "designated standard	5,012	6,210†
Total No. of advisory visits	3,547	4,165†
No. of producers competing for first time in 1930-31	637	
No. of producers who have now competed at least once	4,285	

* Final revised figures.

† Some competitions were still in progress when the returns were received and these figures are, therefore, incomplete.

The figures for the year 1930-31 show a distinct advance on those for the previous year. The conduct of a clean milk competition is an arduous task, and much credit is due to the county agricultural staffs for the manner in which they have carried on the competitions year after year.

Milkers' Competitions.—During the year under review 27 local authorities held 87 milkers' competitions. There were 1,651 competitors, of whom 1,259 reached proficiency standard. These figures show little variation from those of the previous year.

Courses for Sanitary Inspectors.—Nine courses were held during the year, and were attended by 144 officers who are in charge of the local administration of the Milk and Dairies Order. This number is smaller than that of last year, but it is to be remembered that the majority of the inspectors have already attended courses of this kind in previous years.

Courses for Cowmen.—An interesting experiment in a short course for cowmen—the first of its kind—was conducted during the year by the Hampshire County Council at its farm school at Sparsholt. The course, which was held in September, 1930, was of three days' duration; its object was to give cowmen a really practical acquaintance with the up-to-date management of the dairy herd in respect of feeding, housing, milking and management generally. A fee of 15s., inclusive of board and lodging, was charged, and the course was attended by 11 men. The results were encouraging, and it is to be hoped that this type of course may be extended when financial circumstances permit.

Special Advice on Dairy Husbandry.—Mr. R. Boutflour, the Director of Dairy Husbandry attached to the Harper Adams Agricultural College, who was specially appointed to act in

an advisory capacity generally over England and Wales, continued to work in close co-operation with the county agricultural organizers. He addressed 36 meetings, at which the attendance averaged well over 100, and gave demonstrations at 11 centres, where there was an average attendance of more than 40. In January, 1931, he resigned in order to take up the Principalship of the Royal Agricultural College at Cirencester.

Dairy Bacteriological Advisory Service.—The work of the dairy bacteriologists (10 in number) stationed at universities and agricultural colleges has already been mentioned in the Research Section of this Report, which appeared in the last number of this JOURNAL (p. 521). Here, it is only necessary to say that they have again proved their value for the purpose of improving the standard of milk production. Without their aid the satisfactory conduct of clean milk competitions would be almost impossible. The services which they render cannot be properly set out in statistics, but it may be recorded that during the year they made over 26,000 analyses of milk and dairy products.

(D) Poultry and Small Live Stock.—The correspondence of the Ministry with prospective poultry farmers, and the number of requests for information on technical problems, showed no diminution during 1930-31, and indicate that the poultry industry still continues to make a wide appeal. Although the average price of British eggs during the year showed a marked decline, nevertheless, the economic position of the industry was not, on the whole, unfavourable; until the end of the year poultry farmers had held their own in a period of agricultural depression.

The principal event was the Fourth World's Poultry Congress, which was held at the Crystal Palace from July 22-30, 1930. A full account of the Congress is given in the official report of the proceedings, copies of which can be obtained from H.M. Stationery Office, price 10s. 6d. net. It need only be said here that the Congress was a great success. Sixty countries were represented, more than 2,400 members and delegates were registered, and the Congress and Exhibition attracted more than 80,000 visitors. It is satisfactory to report that the net cost of the Congress was substantially less than £5,000. It may be largely counted to the credit of the Congress that our exports of live poultry for 1930 showed an increase of more than 30 per cent. over those for 1929.

Instructional and Advisory Services.—In most counties an expert poultry instructor is employed by the county authority.

In some counties there are two such instructors, and in others the instructor combines poultry work with dairying. During the year there were 78 instructors engaged in county poultry work, of which number 13 dealt also with dairying. The number of students taking courses in poultry at the National Institute of Poultry Husbandry, agricultural colleges, and farm institutes was maintained at about the same level as in previous years.

The National Poultry Institute Scheme.—The 1930-31 session at the National Institute of Poultry Husbandry, Newport, Shropshire, was very successful; the number of students enrolled was 42—the largest in the history of the Institute. During the session that ended in July, 1930, one advanced and nine first-year poultry certificates were awarded—two with distinction.

The capital grant of £5,000 from the Empire Marketing Board, which was mentioned in last year's Report, was used, *inter alia*, for the completion of the administrative building at the Institute, the erection of an incubator cellar and marketing building, the construction of two cottages for staff, and the enlargement of brooding facilities to include battery brooders.

The experimental work conducted under the National Poultry Institute scheme deals with the following lines of investigation :—

(a) *National Institute of Poultry Husbandry.*—Alternative rations for egg production; management problems of certain types of houses, electric lighting for winter egg production, etc.; problems connected with the production of table poultry; and a certain amount of work in the production of ducks, geese, turkeys and rabbits.

(b) *The Ministry's Veterinary Laboratory at Weybridge.*—Problems of poultry disease—particularly work on the preparation of a vaccine against fowl pox, which has proved to be very successful.

(c) *School of Agriculture, Cambridge.*—Digestibility of the commoner poultry feeding stuffs; work is also in progress on the effect produced by feeding fatty materials, etc., on the quality of both eggs and carcass.

(d) *Breeding Work on Poultry at Cambridge.*—Investigations into the inheritance of fecundity; efforts are being made to develop the productivity of the new sex-linked breed (the "Cambar").

(e) *Northern Breeding Station, Reaseheath.*—The first series of experiments on in-breeding for egg production—in which father and daughter matings were used—are now being brought to a close; results have been obtained which show that such matings are not to be recommended.

(f) *Southern Table Poultry Experiments at Wye.*—During the first part of 1930 a series of experiments was completed to compare

the respective merits of wet mash, dry mash and combined wet and dry mash feeding for the production of table poultry. The experiments showed that dry mash can be used successfully for feeding birds that are to be "crammed." In the autumn of 1930 an investigation was begun on the question whether a cheap fattening ration could be used without detriment to the finished bird.

County Egg-Laying Trials.—During 1930-31, 30 trials were conducted under the Ministry's scheme, as compared with 24 in the previous year, and the number of birds entered was 6,450, as compared with 4,520. The average egg production per bird in the trials has shown a steady rise each year; it reached 182.33 eggs per bird in 1930-31 (during a period of 48 weeks), as compared with 179.43 for the same period in the previous year.

The Millers' Mutual Association have generously presented to the Ministry a valuable Gold Challenge Cup for competition among counties conducting egg-laying trials under the Ministry's scheme; the main condition attached is that all wheat offals used in the rations fed at the trials shall be British-milled.

Cockerel-Breeding Scheme.—This scheme, which was described in the Report for last year, was taken up by Cambridgeshire, Bedfordshire and Essex during 1930-31 and was highly successful. At a sale of cockerels near Chelmsford 72 were sold, and the average price was £2 15s. per bird, one cockerel making as much as £10 10s.

Accredited Poultry Breeding Stations.—The principal object of this scheme, which was described in the report for last year, is the provision of facilities whereby poultry-keepers generally throughout the country may acquire healthy stock of good quality from breeders of proved reliability.

Stud Goat Scheme.—This scheme, which has for its object the improvement of milch goats kept by smallholders, cottagers and persons of similar position, is administered by the British Goat Society, to which body the Ministry refunds the amount paid in respect of premiums for approved services and makes a grant towards the cost of administration and travelling, etc. Particulars of the scheme were given in the Report for 1929-30. During the year 1930-31 100 centres were approved under the scheme, and 1,486 services were approved for premiums.

(E) *Miscellaneous.*—(1) *Scholarships for the Sons and Daughters of Agricultural Workmen and Others.*—Awards under this scheme are confined to (a) sons and daughters of agricultural workmen and of working bailiffs and smallholders

whose means are comparable with those of agricultural workmen; (b) sons and daughters of other rural workers whose means and method of livelihood are comparable with those of agricultural workmen; and (c) *bona-fide* workers in agriculture. During the 10 years (1922-1931) that the scheme has been in operation, 1,246 scholarships have been awarded; of these, 63 were for 3- or 4-year degree courses, 91 for 2-year diploma courses, and 1,092 for farm institute courses. The occupations followed by the parents or guardians of the selected candidates were as follows:—

Occupation of parent	Period		Total
	Nine years 1922-30	1931	
Agricultural workman	292	33	325
Working bailiff	77	18	95
Smallholder	272	34	306
Other rural occupations	178	27	205
Candidates who qualified on their own account as <i>bona fide</i> workers in agriculture	277	38	315
Total	1,096	150	1,246

Scholars who have completed their courses number 831, and comparatively few of these have drifted away from agricultural occupations. The latest information may be summarized as follows:—

Teaching, research or official appointments	77
Veterinary surgeons	2
Agricultural posts of a supervisory nature	124
Engaged in practical agricultural occupations	405
Working on own account	16
Died	3
Obtained employment outside the agricultural industry	38
Seeking employment at date of inquiry	44
Cannot be traced	122
Total	831

It should be explained that, of the 122 ex-students who cannot now be traced, the majority have been, and probably still are, engaged in agricultural employment, but touch with them has been lost owing to their movement from farm to farm.

(2) *Young Farmers' Clubs*.—The steady progress of the National Association of Young Farmers' Clubs which was noted last year continued. There were 137 clubs in active operation in 1931, with a total membership approaching 3,000. There were clubs in all but seven of the English counties, and the efforts of the Association to establish the movement in Wales are succeeding, eight clubs having come into being in the Principality since the spring of 1931.

The Silver Challenge Shield for the best Young Farmers' Club in England and Wales was awarded in 1931 to the Horsham Calf Club, which has a membership of 38. The stock kept includes 25 pedigree Guernsey down-calving heifers.

The Tenth International Dairy Cattle Judging Competition, 1931, took place at the Royal Agricultural Show, Warwick, on July 8, when teams representing the United States of America, Northern Ireland and England competed for the *Daily Mail* Gold Challenge Cup. This was the first appearance of Northern Ireland in the competition. The contest attracted a large number of spectators, and resulted in a win for the U.S.A. team. Northern Ireland was second and England third.

The annual national dairy cattle judging competition was held at the Dairy Show in London on October 21 and 22, and secured a record entry of 15 teams. The Silver Challenge Cup of the *Farmer and Stockbreeder and Agricultural Gazette* was won by the "B" team of the Buckinghamshire Young Farmers' Clubs. On the following day the first annual poultry judging competition for Young Farmers' Clubs was held at the Dairy Show, when eight teams judged three classes, each of four hens, of the Light Sussex, White Leghorn and White Wyandotte strains respectively. An interesting competition resulted in a win for the Shipley Poultry Club.

(3) *Sugar-Beet*.—In 1931, for the fifth year in succession, a programme of education and research in sugar-beet cultivation was carried out under the auspices of the Ministry, with the aid of funds supplied by the factories. The programme included a prize scheme under which, in each of the 17 factory areas in England and Wales, cash prizes were offered for the best crops of beet produced by three different classes of growers (classed according to the acreage of beet grown), taking into consideration, in addition to yield, the kind of soil, cleanliness, cultivation and adequacy of manuring. The final awards were made, as in previous years, by three judges, viz., Sir Daniel Hall, K.C.B., F.R.S., Mr. T. Baxter, and Mr. W. J. Atkinson.

The awards under the Regional Prize Scheme, 1930, were presented to the successful growers by the Parliamentary Secretary to the Ministry, Earl De La Warr, at the Central Hall, Westminster, on April 28, 1931. The Alfred Wood Championship Cup was awarded to the Spalding Bulb Company for a crop, on 41 acres of silt, of 17.6 tons of clean beet per acre, of 17.09 per cent. sugar content.

A SCHOOLMASTER-FARMER OF EIGHTEENTH-CENTURY YORKSHIRE

JOHN RANDALL AND THE SEMI-VIRGILIAN
HUSBANDRY, 1764

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THE eighteenth century, like all other times of rapid change, was an age of restless activity, and, since close specialization was not yet required by the state of knowledge, many men found it easy to turn their hands to different occupations in their efforts to provide for themselves. Farming also was the most important of the Nation's trades, and almost everyone was living in a farming district, because most of the towns were still so small as to be little more than villages. For that reason almost everyone knew something about agriculture, and numerous books on the subject were written by amateurs. Country gentlemen, the clergy, farmers themselves, and last but not least the hack writers of Grub Street, those penurious slaves of the booksellers, all employed themselves in producing didactic works for the farmer.

Randall was amongst these. He was a typical product of his day, and, although we know little more of the details of his life than is supplied by his own writings, we can at least deduce that he was a man of ideas and resource. Perhaps he was too much a man of ideas to be a really successful practical farmer, but that does not clearly appear. John Wynn Baker, indeed, suggests that he may not have carried out the practical cultivation of all the crops he recommends,* but that is not the opinion of a later writer, who says †:—

"The whole work is a valuable one, as it embraces widely the new system of pulverization, or the drill cultivation, and applies it in a very tolerable perfection. The author drills the crops of every kind, and scarifies the intervals throughout the summer. A spiky roller is figured, and two portraits of skeleton ploughs for the purpose of moving the intervals between wide drills. The education of the author enabled him to treat the subject scientifically, which he has well performed, and afterwards applied the principles to the field in the process of cultivation."

Randall's system is described in two books issued in 1764—*The Semi-Virgilian Husbandry deduced from various experiments* and *The Construction and Extensive Use of a newly invented Universal Seed-Furrow Plough*. Donaldson's high opinion of these works was not held by Baker, who was one of

* *Experiments in Agriculture* . . . for 1769-1771. Introduction,

† John Donaldson: *Agricultural Biography*, 1854, p. 53.

Randall's contemporaries and, perhaps, competitors. Baker says :—

"He is much bewildered, unintelligible, and mistaken in his first principles, as to his general system—and as to what he calls his *Semi-Virgilian Husbandry*, it is a system founded upon the Labours of another, whose genius was too vast for humble Imitation, but was made for creating—I mean Mr. Tull, whose Path Mr. Randall seems to have followed, yet, at a very humble Distance, unworthy of a Man of Mr. Randall's learning—At the same time there are two or three ideas in Mr. Randall's work, which are worthy of the highest Praise."*

Some part of this severe criticism may have been due to Baker's desire to claim precedence in the introduction of the Cabbage husbandry, i.e., the field culture of cabbage for fodder, but it is probable that this was in some degree common in Yorkshire before either writer published his work.

That Randall's style was not sufficiently clear is emphasized by another contemporary, who says, however, that it had given some pleasure to him :—

"The author certainly means well, and seems to have had experience ; but the method he has taken to recommend his system will not, we fear, be attended with much success. Every work, by which a farmer is to be instructed, should be plain, clear and perfectly intelligible ; whereas Mr. Randall's essay is obscure in many parts, abstruse and not a little confused : in truth, one reason for our inserting this long letter is an opinion we have entertained of Mr. Randall's treatise, in its present form, is not likely to fall into the hands of many farmers ; and his method of cultivating cabbages is certainly worthy of attention."

This writer deplores the introduction of the scientific principles, praised by Donaldson a hundred years later, because farmer-readers distrust philosophy, not because Randall's statements were inaccurate.† A further criticism was levelled at Randall because he gave three plates of his drill, but omitted to describe the component parts.‡

Both his contemporary and his later critics expressed a high opinion of Randall's learning, a touching exhibition of human faith in the qualifications of certain professions. Randall states on the title page of *The Semi-Virgilian Husbandry* that he was then "some Time since Master of the Academy at Heath, near Wakefield" and dates it from York, 1763, although its imprint date is 1764. At that time he had set up a school in York, which is advertised in the book. It was a boarding school, and six of the scholars were accommodated

* *Experiments in Agriculture* . . . for 1769-1771. Introduction.

† *Museum Rusticum et Commerciale*, III (1765), p. 85 ff. Editor's comments in a footnote to a letter from Eboracensis of Halifax, Aug. 27, 1764.

‡ *Gentleman's Magazine*, 1764, p. 460.

in Randall's own house, while other groups of six were boarded with private families in the town. A later advertisement of the school tells us that he instructed young gentlemen, in addition to the then ordinary curriculum of polite learning,

"in the mechanical and geometrical principles of all the implements of husbandry I have constructed; and which are now in use in many parts of the kingdom: as also the common ploughs of different counties, etc. . . . And, I heartily wish, for the happiness of all our worthy farmers, that such a place of instruction was established in every county in the kingdom,"*

a pious wish, which has not yet been completely fulfilled, although steps in that direction have been taken.

Even this does not complete the list of Randall's activities. We should expect a schoolmaster to have some purely literary inclinations, and this farming amateur is no exception. In his second work on the Seed-Furrow Plough we find proposals for printing on a subscription basis Ovid's *Metamorphoses*, Virgil and Horace with a French translation, but whether this work was ever completed is unknown.

According to his Preface to the *Semi-Virgilian Husbandry*, which, as Donaldson says, occupies 52 pages and enters largely into the spirit of the contents, this book was written about eight years before its imprint date. The author first sent the MS. to the *London Chronicle*,

"in order, from time to time, to communicate the Contents to the Publick, for the consideration of those gentlemen, who are desirous of improving Agriculture: but after publishing some sheets in that manner, without the author's name, many readers, who are judges of the subject, induced the bookseller to treat with me, about buying the whole Copy, in order, contrary to my reputation, to print it in this present volume."

This story is reported in the other work.

Randall goes on to condemn the inconveniences of all the machines which the New Husbandry, i.e., the theory of cultivation based upon Jethro Tull's ideas, had so far produced, and then sets out the philosophical aspect of the subject:—

"The parts of knowledge for a gentleman, who would understand this Treatise, are the philosophy of earth (mould) in general, the nutritive principles, which promote Vegetation, the philosophy of the Atmosphere, and how the Celestial Influences affect the Soil."

From this point of departure he enters into a discussion of specific gravity, as we should say, and the geological history of the earth intermingled with a great deal of theology. Speaking of making experiments he says:—

"There is sometimes only a paper wall between a useful discovery and the greatest ignorance of the nature of things . . . to promote the growth of the plant, is to set all its mechanical powers at work,

* *Museum Rusticum*, VI (1766), p. 438 ff.

to the best advantage, and then surely, there must be a principal bias, if it were known."

Randall, with a perception, the truth of which was to be more clearly realized later, thought that "light soil, thoroughly fine and replete with nutritive ingredients," would exceed the produce of stiff lands, but, with a feeling for the really scientific spirit, rarely experienced in those optimistic times, adds that the truth of his propositions must be determined by experiments, and sets out his theory of plant nutrition, which is of little interest here.

Good loam made fine by common ploughing, and this without dung, will, he estimates, produce 48 bus. of wheat; made fine but weedy only 36 bus.; fine and dunged, better than 24 bus. These figures are, he claims, the results of actual field experiments. His system is deep ploughing by the use of two ploughs following one another in the same furrow, which will, he states, produce much more than 48 bus. Well fallowed and duly prepared stiff soil free of weeds will produce 48 bus. This yield is apparently his standard of high farming results, but he only says that the land will, not does, produce this quantity. It is so much in excess of what must have been the then average yield—somewhere about 20 bus. an acre—that Randall here displays the fact that he is more a theorist than a farmer. On this basis, however, he makes a number of mathematical calculations showing how the crop varies according to the different degrees of fineness of tilth, the addition of dung and so on.

He admits that the practical farmer of the time thought himself well used by his land if, in general, or a course of years, he should secure 24 bus. of wheat, but insists that the combined or semi-Virgilian husbandry will double this. Stiff lands then, however, have, he says, produced no more than 12 bus. if the fallow season had been unfavourable. These comparisons all seem too arbitrary, although Randall claims to have carried out experiments, and admits that he was never able to equal the yields obtained by Tull, whose methods he had tried in light soil. Randall's labourers, like many others, were averse from innovations, and would not use the machines carefully enough, and in spite of his "improver's" outlook, Randall still believed in a fallow every fourth year. Tull, he thought, had brought some disgrace on the drilling of wheat by not preparing the fallows sufficiently.

He gives a list of the rotations of common husbandry, but these represent the most modern practice of his day, and were certainly not general throughout the country even many

years later—as Young’s *Tours* and the *County Reports* issued by the Board of Agriculture at the end of the century show very definitely. When we consider that he says the Norfolk 4-course system was that common to deep light and unstoned land this is emphasized, because the system had not yet become general even in the restricted area where it originated. Randall says that the Norfolk course was practised on the open fields where custom would permit, but observers of the day, tourists for pleasure and others, tell us that it had been adopted only in a very few places. On the loams the same course was used, sometimes followed by wheat, barley, peas and oats, which was as long a course as was general on unenclosed land of this sort throughout the kingdom. The stiff land was cropped: fallow, wheat, beans and oats. Where custom had been broken through, the rotation could be carried on for seven years, and he proposed for this period a course of fallow, pease and turnips, barley, clover, wheat, horse beans, oats. If the Norfolk course is in use in open fields, he graciously admits that the *Semi-Virgilian Husbandry* “has nothing further to do than to exhibit the most promising methods of fallowing and preparing the ground . . . and raising the crops without dung.” As to the new and much lauded inclosures he tells us that in those on the heaviest and lightest soils the farmers do not stop seldomer for a fallow than those working soils of the same nature in the open fields.

Randall did not believe in folding sheep on turnips, because of the waste “by biting here and there in a wanton manner.” The *Semi-Virgilian Husbandry* obviates the necessity for their manure and the grass land needs it, so the turnips should be drawn and fed in the meadows.

Practically all this is contained in the Preface. The book itself opens with a dissertation on “The manner of recruiting worn out land by duly preparing it for the treasures of the atmosphere,” but an almost perfect brief description of the theory it expounds is given by the footnote to the letter of Eboracensis:—

“By the Virgilian method of husbandry Mr. Randall means that commonly practised; the Semi-Virgilian Method is another name for the new husbandry executed by the ordinary implements of which Mr. Du Hamel has treated in his *Elements of Agriculture*.”*

One of Randall’s favourite crops for this system of cultivation was the cabbage crop, of which he says many successful experiments have been made both to the improvement of the ground and also to oxen, cows and sheep.

* *Museum Rusticum*, III (1765), p. 85: see also cit. 6.

Both in this book, and in his treatise on his own Universal Seed-Furrow Plough, Randall deplored the lack of a machine that would do the desired work satisfactorily. He inscribed the latter book to the Royal Society of Arts "till the limited time of their examining the Ploughs themselves approaches."

To him it was

"something strange, that an unexceptional machine, for this purpose, has not yet appear'd. Some persons think any rough principle most likely to be general; whilst others are of opinion, that nice combinations of the mechanical powers are absolutely necessary to perform this desirable, tho' difficult task. These two extremes have effectually retarded the progress of very great improvements, as they have both in their turns, disgusted many friends of the new husbandry..."

Perhaps, naturally enough, hardly one of the drills before his own obtains any praise from Randall. That designed by Worlidge was too light, "rather a child's go-cart." Tull's also had defects. The epithet "child's go-cart" was applied again to a drill plough Randall obtained from Wm. Ellis*: this was erratic and only worked sometimes; it sowed only one row, but had two hoppers, one for seed and one for compost. Du Hamel had tried to improve Tull's drill, but the seed delivery of this type was uncertain and irregular. The best then available was Chateau Vieux's drill as simplified by his fellow-countryman De la Levrie.

Even the drill Randall designed himself was difficult to use, and the first he made cost him £20, a large sum of money in those days, but in 1764 he said that one had been used for some years by a gentleman and would set 28 acres of potatoes or beans, and sow any kind of corn. He hastens to disclaim any intention of making free with other people's ideas, and if anyone thinks he has done so, he hopes they will do the same with his own, as they were published with that object. With four shifts of men and horses his drill would sow 14 acres of wheat a day, or so he says. Complete details of the adjustment necessary to fit the machine for different sizes of seed, number of rows (the maximum was three), depth of planting, and all types of land are supplied, and plates at the end of the book show the details of construction. The criticism levelled at the machine by the editors of the *Gentleman's Magazine* was that "it seems, as the author himself is aware, rather too complex for general use; for by so many movements, as are necessary to make it operate, it must either be rendered too heavy for the seedsman to manage, or too slight for the rough work it is to perform."† The machine was then, however,

*Of Harpenden, Herts, and author of several books on farming.

† 1764, p. 400, cf. T. H. Marshall, *Jethro Tull and the New Husbandry*. Econ. Hist. Rev., II (1929), p. 56.

only in the trial stage, and Randall enters a caveat against this criticism by saying the machine was intended for the use of country gentlemen first and might perhaps afterwards be reduced to a very simple state for the common farmers if they could be persuaded to use a seed plough.* The inventor was then engaged in trying the machine till the end of the following year for the Society of Arts: he had wished to give a public demonstration of it in work, but had not been able to do so.

One possible result of using his drill rather frightened Randall, and that was its extension of the acreage under potatoes, so he explains:—

“I do not imagine that growing potatoes in this wholesale way, by this Drill Plough, will find a market, were the practice to become general; but what I aim'd at in the diligent cultivation of this vegetable, was to improve the ground, and favour my design of breeding and bringing up a very great number of hogs, at each of four large farms, for the *London* markets . . .”

The potatoes were to be fed, after boiling, with turnips, carrots, parsnips, cabbages and buckwheat, only the unmarketable tubers being so used. The pigs would be sent to the London distillers for fattening on grains, and the larger potatoes would be sold through an agent in London.

The draining plough described in the book was entered for the premium of the Royal Society of Arts and in general construction it resembled the better known implement designed by Cuthbert Clarke.† It cut a trench 1 ft. 8 in. wide at the top, 10 in. wide at the bottom and 1 ft. deep.

There was at this time general dissatisfaction among the “improvers” with the numerous varieties of plough. These were made locally, and the village smiths and carpenters, even when working on a design well known in their district, almost inevitably produced deviations from the traditional pattern, so that no two ploughs were exactly similar, and there was no guarantee that a buyer would get an implement that would serve him so well as a previous purchase from the same ploughwright. Randall's predecessors, Tull, Du Hamel and Chateau Vieux, all deplored this, and that the ploughwrights possessed no good guide for plough-building. Randall had therefore “ventured to point out something of the theory of the common plough that more able heads may finish what is here only roughly attempted”—a surprising outburst of modesty on his part! He deals with the line of draught,

* *Gentleman's Magazine*, 1764, p. 515.

† See article on Cuthbert Clarke: *This JOURNAL*, XXXVII (Sept., 1930), p. 571 ff.

the balance between the beam and the share, and the principles of a plough built like half a wedge passing through the soil. One of the most popular of the improved ploughs was the Dutch or Rotherham, and this was extensively used in the northern counties, but, like other ploughs, it "only performed well in certain soils," and this experience was a further encouragement to the production of a general exegesis on plough construction.

Two years after the publication of his books, Randall contributed an article to the *Museum Rusticum*: "Observations on the Structure and Use of the Spiky Roller."* This essay was provoked by a contribution on the same subject signed "A Clay Farmer." Randall claims to be the inventor of the implement, saying his was "the first he ever saw or heard of, except what the late Mr. Ellis mentioned to so little purpose."† His claim was admitted in an editorial footnote, which also states their obligation for the article, and was admitted also by at least one contemporary writer.‡ We know, however, that such an implement was in use in Essex at least 60 years before his was made; some Essex "rowls" were then fitted with oaken pins in rows 12 in. asunder, the pins being 3 in. long and 4 in. apart.§ Randall himself acknowledges a little later in his essay that he feels uncertain about the validity of his claim by saying, "Let who will be the *father*, or *grandfather* of this valuable instrument of husbandry, I had reason to be extremely pleased at my lucky hit, in constructing it from Mr. Ellis' barely mentioning a spiky roller: though with his usual giddiness he gave his readers no more than the name."

The spirit of the eighteenth-century "improvers" is clearly defined in this sentence. Like Randall, many of them were amateurs at farming and many more were wealthy landowners, who could afford to take the risks always involved in trying out new systems. The general feeling, however, seems to have been that, apart from any large gains they might themselves obtain, as a result of their experiments, they should make them available to the whole agricultural community whether or not they reaped a substantial reward for themselves. Moreover, among this class, a limited one it is true, there was a willingness to try anything once, however doubtful it may have appeared, and it is to this spirit that we owe the measure of progress made then, which was certainly the foundation

* Vol. VI (1766), p. 371 ff.

† See W. Ellis, *New Experiments in Husbandry for the month of April*, 1736, p. 16 ff.; and *Modern Husbandman II* (1744), May, p. 20.

‡ Thomas Bowden: *The Farmers' Director*, 1776, p. 41.

§ J. M. (John Mortimer): *Whole Art of Husbandry*, 1707, p. 43 ff.

of the prosperity of the nineteenth-century period of high farming, if the effect was not so immediate as we are sometimes led to believe.

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(2) *The Construction and extensive Use of a newly invented Universal Seed-Furrow Plough (From time to time expos'd to the public View of abundance of People) . . . Also, by the Invitation of the Society, The Construction of a Draining Plough . . . With the Construction and Use of a Potato Drill Machine . . . to which is added An Essay on the Theory of a Common Plough . . .* by J. Randall, a few Years since Master of the Academy at *Heath*, near *Wakefield*, Yorkshire. 4to. 7 plates, pp. xiv, 97. 1764.

Notes.—This does not seem to be in the British Museum Catalogue.

I have read it by the courtesy of the R. A. S. E. Library.

(3) See occasional essays in the *Gentleman's Magazine*, 1764, and *Museum Rusticum* as given in text. It is possible that Randall was also the author of another book : see G. E. Fussell : *A Yorkshire "Book Farmer's" Ingenuity—Mr. Ladner of Kroy*, 1764, *Estate Magazine*, XXXII (1932), p. 278 ff.

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CULTIVATED BLACKBERRIES

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THE cultivated Blackberry has only come to the fore comparatively recently in this country, but during the last five or six years the area under cultivation has increased considerably and will probably continue to increase.

As the Blackberry can be grown satisfactorily on a wide variety of soils and under very varying conditions, it is necessary to point out that growers must adapt their methods of training, manuring and distances of planting to suit their own local conditions, and although this article has been written with particular reference to the methods found most suitable at Wye, care has been taken to indicate where modifications may be useful or necessary.

Varieties.—The British wild Blackberry (*Rubus fruticosus*) is a wide and variable species of which many seedlings have been introduced to cultivation from time to time. Particulars of some of these seedlings, given in most nurserymen's lists under various names, are selections from the British or English or common wild Blackberry.

Numerous varieties derived from several species are available, but many of them will only grow satisfactorily under certain conditions and in particular soils. The varieties Himalayan Giant and Parsley Leaf have been the most widely and successfully cultivated and have proved satisfactory at Wye College.

Himalayan Giant.—This variety belongs to the species *Rubus procerus*, and will produce good results under most conditions and when grown in almost any soil. The fruit is large and round, and the colour jet black but rather dull. The flavour is fairly good, but not very sweet unless the fruit is reasonably ripe. The berries should be picked when still firm as they do not travel well when too ripe. The leaflets are large and oval. The variety is an immensely strong grower and produces very stout canes, sometimes as much as 15-20 ft. long on strong soils. It is also an extremely heavy cropper, and may produce as much as 6 tons per acre.

Parsley Leaf.—This is a variety of the species *Rubus laciniatus*. Although it is popularly believed that the variety originated in America, on account of its wide-spread occurrence in some of the Western States, it is really a European species. The fruit is large and roundish oval in shape with very large drupes, and the colour is shining black. The flavour is very good. The leaves are cut-leaved and fairly large, the petioles being covered with down-curved prickles. The canes are fairly strong, dark red in colour, also with down-curved prickles. The fruit of this variety is firm and travels well and it usually ripens about 5 to 10 days later than Himalayan Giant. Parsley Leaf has not cropped nearly so heavily as Himalayan Giant at Wye, the average crop being less than two tons per acre, but on the richer and deeper soils which this variety likes a higher yield should be obtained.

The variety *Wilson Junior* was a complete failure at Wye although it has been grown successfully in some districts. Of the three varieties which have been grown here, Himalayan Giant has proved the most satisfactory in every way.

Soil and Situation.—Blackberries will thrive in most soils. Some varieties will crop well and make plenty of new growth each year on a fairly poor soil, while others require a richer soil. This can be illustrated by results obtained at Wye, where the Himalayan Giant planted on a poor loam, four or five inches deep with a subsoil of solid chalk, in 1924, cropped well, and was still cropping well and making plenty of new wood in 1931, whereas Parsley Leaf on the same soil has produced hardly any crop and made very little new growth.

Both varieties have had exactly the same treatment in every respect.

Adequate drainage is essential, and any soil sufficiently well-drained is suitable for strong-growing varieties such as Himalayan Giant, but Parsley Leaf and weaker-growing types require a richer and deeper soil to obtain the best results. Replanting with blackberries is a possibility in grubbed hop gardens.

These varieties of blackberries are not very susceptible to frost, but it is wise to avoid situations where hard frosts may damage the tips of the young canes and cause them to die back. A south or south-east aspect is probably the most suitable.

Propagation.—Blackberries can be propagated from “tips,” cuttings or seed.

(1) *Plants raised from Tips.*—This is the most satisfactory and common method of propagation, and plants raised in this way are usually the strongest and most reliable for planting. Young canes of the current year's growth are selected about the third week in August. Tips should be carefully examined beforehand, as only those with the terminal bud intact should be layered, and the tips of the strongest of these are buried in the soil (layered) to a depth of 4 to 5 in. A small hole should be made about 6 in. deep and 1 in. of leaf mould or some fibrous material put in the bottom with some fine soil on top. The tip should be laid in very carefully so that the terminal bud is not damaged; the hole may then be refilled and the soil pressed down. Rooting is much more satisfactory when leaf mould is used. If the soil is very heavy, a little sand mixed with it will ensure better rooting.

Another method of rooting tips is to use 1 lb. punnets. These are sunk in the ground with a handful of leaf mould in the bottom. The selected tips are laid on the leaf mould and the punnets filled up with good soil and pressed down firmly. When planting out tips raised in this way they should not be removed from the punnets when rooted, but be planted out as grown, and the roots will find their way through the punnets which will rot in the ground. Root damage in transplanting is thus minimized.

Fibre pots can be substituted for punnets in this way, large size 60's being the best for the purpose. The procedure is the same as before, except that the pots should be filled with good sifted soil and no leaf mould is required. Here again the roots will grow through the pot which will rot in the ground.

Tips laid in from the third week in August to the second week in September are usually ready for lifting by the third week in November. If the weather is very dry when the tips are layered and for the following week or two, the time when the rooted tips are ready for lifting may easily be delayed for two or three weeks. Any tips with insufficient roots should be relayered until early April because they will not survive the winter if transplanted in this condition.

Sever the rooted tips about 6 in. above ground.

(2) *Plants raised from Cuttings.*—By this method, two years are required before a serviceable plant is obtained. The cuttings are taken from the fruited laterals when the canes have finished or nearly finished fruiting, at the end of October.

The lateral fruited wood just below a joint close to the main stem should be cut off, the fruited trusses being then removed, making cuttings 8 or 9 in. in length. No buds are removed from the base of the cutting, which is pressed into the soil. These cuttings callus over at the base and in the spring they will root and the top buds break into leaf. One or two shoots will come up from the soil and as there is not much growth the first season the young canes may be tied to a stake or bamboo cane to give room for cultivation.

2 ft. should be allowed between the rows, and 6 in. from cutting to cutting. At one year old, they should be transplanted to fresh land, allowing 1 ft. from plant to plant and 3 ft. between the rows. The first year's growth should now be cut back and not allowed to fruit, or the plant will be too weak for transferring to its permanent quarters the following year.

(3) *Plants from Seeds.*—Propagating in this manner is not to be recommended for commercial purposes owing to the great risk of losing the strain. The surest way of keeping the strain true is to raise plants vegetatively from tips or cuttings.

Plants raised from seed cannot be relied upon to come true to type, though some varieties are better than others in this respect. The probability is that a proportion of the plants raised would prove to be worthless from the point of view of growth, productivity or fruit quality, and even in the good seedlings there is a distinct risk of lack of uniformity.

Preparation of Land and Planting.—Planting should be done in the late autumn or early spring. The land should be prepared and cleaned by ploughing and thorough cultivation

beforehand. A preparatory dressing of dung is ploughed in before planting unless the land is in exceptionally good heart.

For strong-growing varieties, such as Himalayan Giant, the planting distances recommended are 16 ft. in the rows and 7-8 ft. between the rows, while for weaker-growing varieties, such as Parsley Leaf, 8-10 ft. in the rows and 6 ft. between the rows is sufficient. The distances may be varied slightly according to the strength of the land, at the discretion of the grower. The rows should run north and south to obtain the full benefit of the sun on both sides.

Rooted tips or one-year-old plants can be used. If the latter are planted, the young growth should be cut back to 1 ft. from the ground to prevent fruiting. This will avoid weakening of the plant which otherwise may take three years to crop satisfactorily. A good-rooted tip, planted in November or December, will make 8-10 ft. of new growth the following summer.

A hole should be dug about 1 ft. square and 9 in. deep and should be refilled entirely with top soil (after planting). 4 in. of this is laid in the bottom to receive the rooted tip or plant, which may be placed in position and the rest of the hole then filled in and well pressed down. Great care should be taken to avoid damage to the young shoots at the base of the plant as these will form the new growth for the following year.

Stakes may be used to support the young canes the first summer, if the wirework is not erected until the following winter, so that cultivation may be carried out without damaging them.

Manuring and Cultivation.—Blackberries respond well to generous manuring, the amount naturally depending upon the fertility of the soil. 10 to 15 tons of dung per acre each winter is a suitable dressing, except on very strong soils, when the dressing might be given every alternate year.

Fish guano or meat meal, at the rate of 5-6 cwt. per acre, applied round the plants in the spring, has given satisfactory results at Wye, and this dressing might be substituted for farmyard manure every alternate year if the latter is scarce.

Benefit is also derived from the application in the spring of an annual mineral top-dressing consisting of 2 cwt. superphosphate, 2 cwt. bone meal, 1 cwt. sulphate of ammonia and 1 cwt. sulphate of potash. Artificial manures should always be applied round the plants.

Poultry manure gives satisfactory results in quantities of

2-5 tons to the acre, applied as a top dressing in the spring, and will take the place of artificials, but too much causes soft fruit. Shoddy is favoured by some growers, but has not proved satisfactory at Wye.

Cultivation should begin as early as possible in the spring, and unless the wirework is erected the same winter as planting, it is possible to horse-hoe both along the rows and between the plants across the rows the first spring after planting. The land should be thoroughly hoed without damaging the plants. During the winter, the ground in the plant-rows should be dug lightly with a fork, and the land between the rows ploughed, always turning the furrows towards the plants and not away from them. A ridging plough may be used if desired, leaving two ridges between the rows; this method has proved a cheap and effective method of winter cultivation at Wye. Subsequent cultivations consist of annual ridging and digging in the winter and hoeing in the spring. When the wirework has been erected, it is necessary to hand-hoe between the plants.

Wirework.—Three kinds of wirework have been used.

(1) The posts used are 5 ft. 6 in. above ground and support three wires. The bottom wire is 2 ft. from the ground, the second is 4 ft. and the third on top of the posts. The object of stapling the top wire on the top of the posts is to enable it to carry more weight: if it were stapled just below the top the staples would be apt to draw out under the weight of the canes and crop. The cost of the material and labour is about £16 per acre.

(2) The posts are 3 ft. above ground and two wires are used, the lower one 18 in. from the ground and the other on top of the posts as before. The cost is about £11 per acre.

(3) The posts are 3 ft. above ground and a crosspiece of wood, about 18 in. long, is nailed on the top. Two wires are attached to this, one at each end, and a third wire is stapled to the posts about 18 in. from the ground. The cost is about £16 per acre.

The chief disadvantage of this last method is the increased difficulty and cost of cultivating, and although a larger crop may be expected than with No. 2 method, the objections probably outweigh the advantages.

No. 1 wirework is found to be the most suitable type for the stronger growing varieties, such as Himalayan Giant; for the weaker sorts, such as Parsley Leaf, No. 2 system should prove satisfactory.

Hard wood should be used with all methods of wiring. The posts supporting the wires should be sunk about 2 ft. in the ground and should not be more than 12 ft. apart or the wires will sag under the weight of the canes and crop. The end posts should be particularly stout and must be firmly anchored and guyed.

Pruning and Training.—Pruning should be done as soon as possible after the old canes have finished fruiting. These are cut off close to the ground, and the young canes of the current year's growth are trained along the wires for fruiting the following summer. In No. 1 method of wiring, the longest canes should be trained along the top wire and the shorter canes along the second wire. The young growth of the following summer may then be tied to the bottom wire to keep it off the ground. In No. 2 method, all the young canes of the current year's growth may be trained along the top wire, and the new growth of the following summer tied to the bottom wire when long enough. In No. 3 method, the canes for fruiting may be trained along the two wires attached to the cross piece at the top and the young growth tied along the bottom wire.

The canes should be evenly spaced along the wires, overcrowding being avoided, to give the fruit as much sun as possible and to facilitate picking. Two canes are usually sufficient for each wire. Those not required and the very weak ones should be cut out altogether. All prunings should be carried away and burnt as soon as possible. When the young canes are 2½-3 ft. long in the following summer, they should be tied to the bottom wire half on each side of the plant. The canes should not be allowed to grow too long before tying or they may break off when twisted back into place.

Gathering the Fruit.—The season for picking is from early August to about the middle of October. Some varieties may be picked earlier than others and the length of season also varies with the variety. Himalayan Giant is usually ready for picking a week or 10 days earlier than Parsley Leaf, but the two varieties finish fruiting at about the same time.

Good firm berries will always make a better price, and the fruit should not be allowed to get fully ripe before picking. The fruit should not be picked when wet.

Pests and Diseases.—The cultivated Blackberry is usually fairly free from pests, and the only one likely to be of

commercial importance is the Raspberry or Loganberry Beetle (*Byturus tomentosus*). The adult beetles destroy the buds and the larvae infest the fruits, small deformed berries being produced. For the latest recommendations for measures of control the reader is referred to East Malling Research Station, where the pest is being studied. Spraying or dusting with a Derris preparation has proved satisfactory in controlling this pest on Raspberries and Loganberries and is being used at Wye this summer on Blackberries. Two applications should be given, the first about 10 days after the first flowers open, and the second 10-14 days later.

Crown Gall (*Bacterium tumefaciens*) is a disease which sometimes occurs on Blackberries. This disease is evidenced by canker-like swellings on the canes and on the crown of the plant, and when these are observed the plant should be dug up and burnt. The bacteria invade the plant through wounds, and therefore the greatest care should be taken to prevent injury to the plants.

These notes have been compiled in response to a considerable number of inquiries received by the College, and the writer hopes that they will prove helpful to intending growers of this fruit.

* * * * *

THE PRODUCTION OF KILN-DRIED POULTRY MANURE

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[Considerable attention is being given at the present time to the question of using poultry droppings for manurial purposes. Very large quantities are being produced and, to a considerable extent, wasted—despite the fact that their manurial value is by no means insignificant.]

The following is a record of the results of practical work carried out in West Suffolk in the drying of poultry manure in a kiln, similar to that used in maltings. The extent to which such a procedure is practicable is

naturally limited, but the results obtained have been sufficiently satisfactory to justify publication for the benefit of those who are giving the matter their consideration.]

THE value of fresh poultry manure, either as applied to arable land or as dropped on grass land, has long been known ; but the material has been neglected in the past mainly because it was not thought possible to convert it, on an economic basis, into a form that could be easily handled. If used too thickly in its natural state, it may prove "too strong"; hence, users are generally recommended to mix the crude material with earth or ashes before application to gardens and arable land. Poultry manure usually consists of the droppings, mixed with such litter as earth, straw, chaff, peat moss, feathers, and hay from nest boxes, and commonly accumulates in a heap until there is sufficient for use on a large scale. Such heaping may continue for 6 or 12 months, during which time much of the manurial value is lost through fermentation and the heat developed, especially if the material is turned two or three times before being carted on the land.

The great advance made by the poultry industry in recent years has revived an interest in the commercial possibilities of dried poultry manure. Various estimates of the money-value of this by-product have been put forward, and, although reliable figures are difficult to obtain, it is likely that the average annual value of poultry manure is over £1,000,000.

In July, 1931, following correspondence between Mr. H. D. Day, the County Poultry Instructor for West Suffolk, and Mr. H. A. Saltmarsh, of Barrow Hall, Bury St. Edmunds, the latter generously placed the drying kiln on his poultry farm at the disposal of the writers for the purpose of making records of the drying of poultry manure ; and they are very grateful to Mr. Saltmarsh, to his manager, Mr. F. Baxter, and to his kiln man, Mr. Jack Mortlock, for the opportunity afforded of investigating the subject, upon which knowledge is scanty. Through their kind co-operation, it has been possible to prepare this preliminary report.

Type of Farm Producing the Manure.—The holding of Mr. Saltmarsh at Barrow is a commercial egg farm carrying approximately 10,000 laying birds and 10,000 young stock. In addition to the poultry, a flock of 500 north-country ewes is run on the grass fields on which the poultry are housed. Fig. 1 shows a part of the farm with some of the laying stock,

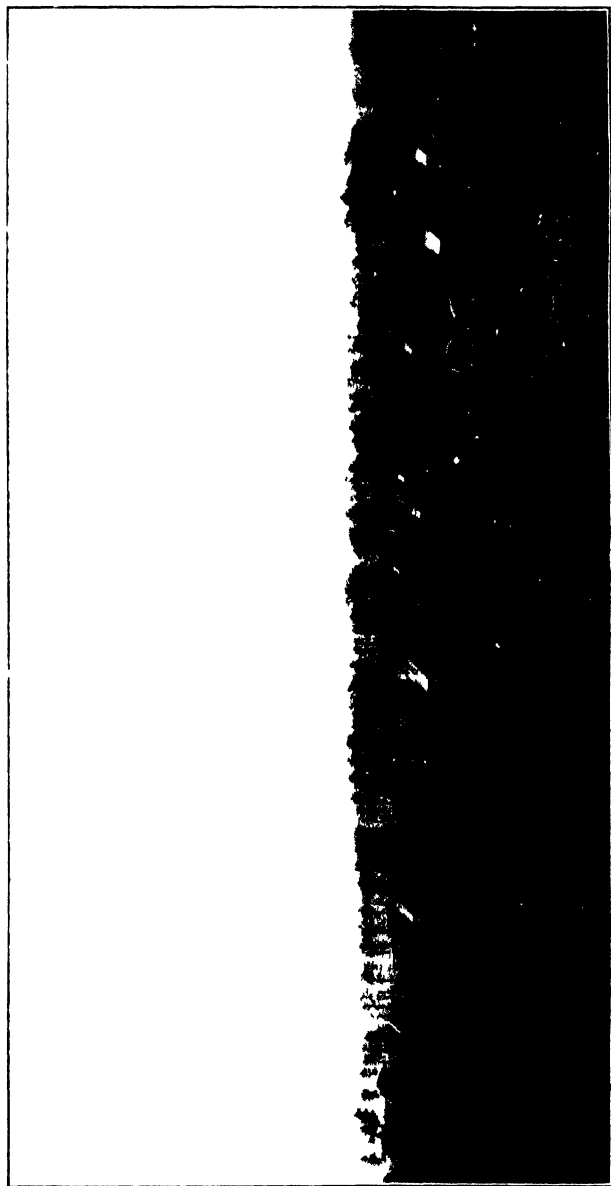
housed in 50-bird houses, with ewes and lambs grazing between the houses. The sheep do not interfere with the fowls in any way, and there is ample space for grazing.

Poultry Houses.—All the poultry houses are made on the farm, and, for both laying and growing stock, are of the slatted floor type with trays under to retain the droppings. Fig. 2 shows one of the houses for growing stock, with the tray drawn out for the collection of the droppings. Each house is cleaned once a week, and the collection of manure continues throughout the week. A low type of trolley (Fig. 3), into which the droppings can be easily tipped, is used for the collection. The droppings are taken to the drying and grinding building, which is situated in the centre of the farm.

Drying the Manure.—In the initial stages of the work, the droppings, as collected, were left in a heap under a small lean-to shed to await drying in the kiln. Considerable heating occurred, however, and it was decided to erect a larger drying shed on the floor of which the fresh collected manure could be spread in a thin layer for a preliminary air-drying while the previous lot was being kilned—usually about two days. For this air-drying, the fresh manure is spread out to a depth of about 3 in., and an appreciable decrease in the moisture content takes place, actual determinations showing a reduction of from 6 to 8 per cent. This procedure has shortened the time of kiln-drying required by about four to six hours (estimated). Alternatively, if the time of the kiln-drying is not shortened, the depth of material on the floor of the kiln may be slightly increased.

The preliminary air-drying could, of course, be extended with a possible further diminution in the time and cost of kiln-drying; but this would necessitate increased drying-floor accommodation. The principle adopted, therefore, has been to provide air-drying accommodation sufficient for the manure collections of the two or three days during which the kiln is occupied with the previous lot. The air-drying shed has three doors and several windows, which are left open to increase the drying conditions if the weather is fine and the wind in the right quarter. Fig. 4 shows the manure spread out on the floor of the air-drying shed. The door to the kiln is on the left.

The kiln is a brick building with a corrugated-asbestos roof, the latter having an inner lining of asbestos sheeting. The heating apparatus is an ordinary coke-burning furnace with



View of part of the poultry farm at Barrow Hall, Bury St. Edmunds, showing some of the laying stock, with ewes and lambs grazing between the 50-bird houses.

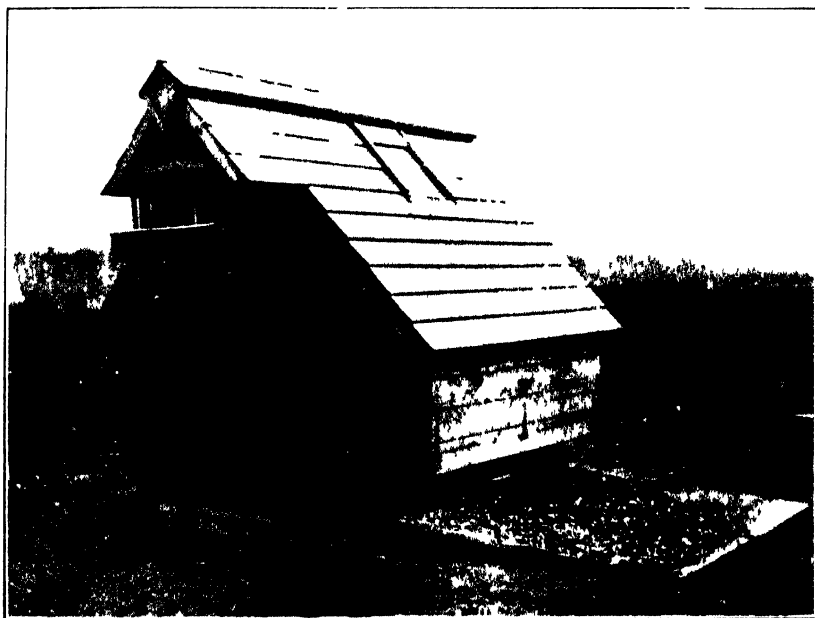


FIG. 2. One of the houses for growing stock at Barrow Hall, with the tray drawn out for the collection of droppings.



FIG. 3. The low type of trolley used at Barrow Hall for the collection of poultry manure.



FIG. 4.—Poultry manure spread out on the floor of the air drying shed.

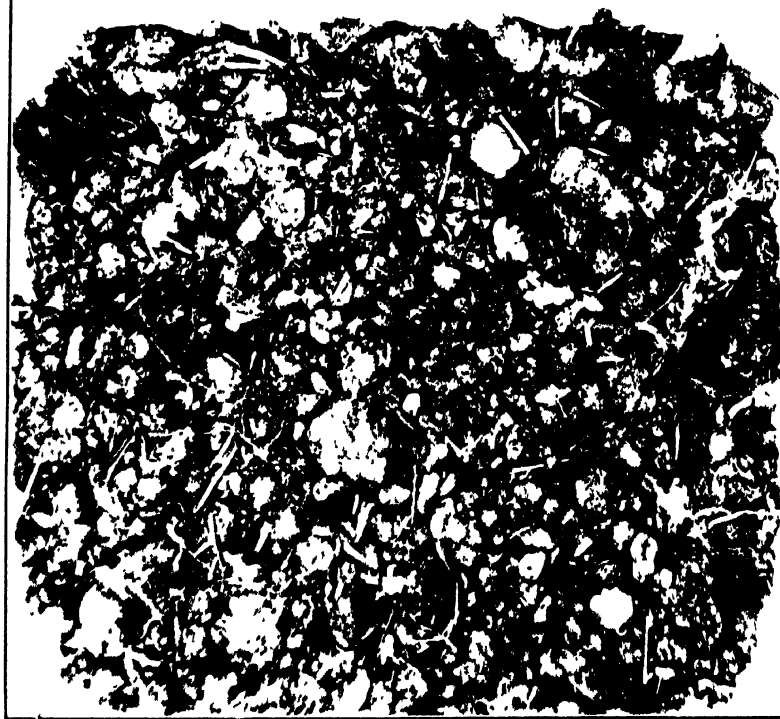
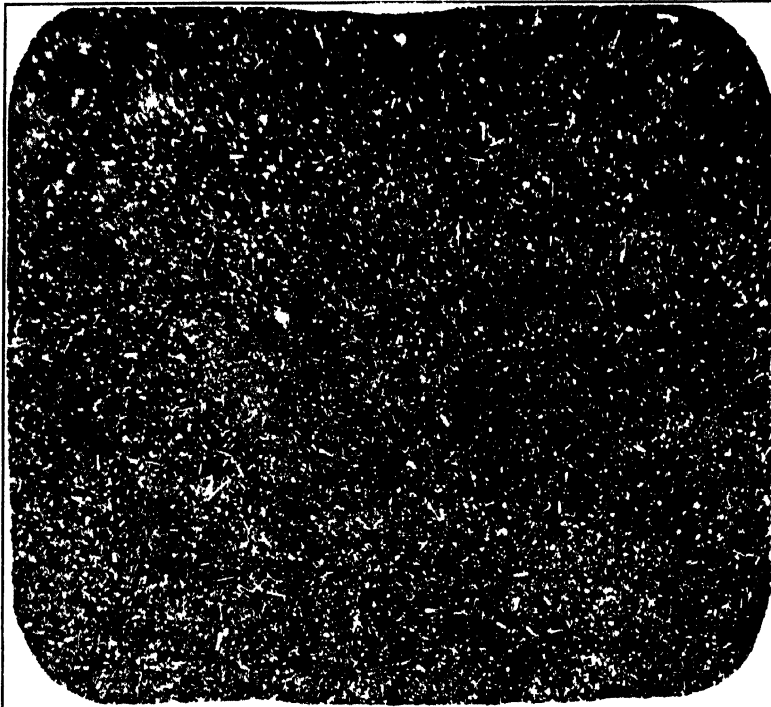


FIG. 5.—Crude poultry manure before drying and grinding.



Kiln dried poultry manure after grinding.

a system of flues, the heat being dispersed by means of a Y-shaped spreader sheet suspended over the main vent. Ventilation is provided by adjustable windows on two sides of the chamber, which is 18 ft. square, and by movable louvres in the chimney.

The drying floor, 7 ft. above the flue level, is of $\frac{1}{8}$ in. metal mesh carried on metal joists, the mesh allowing for the penetration of heat without allowing much of the fine material to fall through on to the flues. The manure is spread on the drying floor to a depth of 7 to 8 in.

The time required for the kiln-drying varies within fairly wide limits. It was hoped that the investigation would give definite information about the time required to effect satisfactory drying, but weather and other conditions, including direction and velocity of wind, prevalence of rain, condition of the manure and depth of the material on the kiln floor, had a marked influence on the amount of drying necessary for any particular sample. When it is stated that the moisture content of the manure, as collected, ranged from 29.7 per cent. (laying flock in dry weather in August) to 62.9 per cent. (laying flock in wet weather in February), some idea of the variation may be realized.

When the manure is wet it is desirable to reduce the thickness on the kiln floor, but to avoid loss of heat this reduction should not be carried too far. In general, it has been found advisable to maintain a depth of 6 in. if the material is very wet, increasing to 8 in. if it is reasonably dry. Under normal conditions, 48 hours' kiln-drying has proved sufficient for average material 6 to 7 in. deep on the kiln floor; for similar material spread 4 in. thick 30 hours has sufficed; but 9 in. of wet material may require 72 hours. Usually, about 4 tons of manure are dried in one lot, yielding approximately 2 tons of the dried material. About 100 tons of the dried product have been produced and sold in 18 months.

Occasional turning of the manure while being dried is desirable; as a general rule it is turned two or three times. As an indication whether the material is sufficiently dried, it may be said that if a lump, such as can be readily held in the hand, is dry throughout, then the fire may be drawn, and the manure, when cooled off, transferred to the grinding shed. An experienced man, such as the kiln man employed by Mr. Saltmarsh, who has had experience in maltings, can judge the moisture content of a sample so accurately that successive lots of dried manure will rarely vary more than 2 per cent. in this respect.

Thermometer readings taken on the kiln floor have shown that it is possible to control the firing so that very similar temperatures can be maintained for successive lots of material. The maximum temperature recorded on the kiln floor was 310° F. A temperature approaching 300° F. is generally attained during the drying period, but a considerable fall often occurs during the night. A typical series of readings is as follows :—

1st day.	10.30 a.m.	90 deg. F.	Kiln closed and fire just started.
	12.0 noon.	110	
	4.0 p.m.	200	
	8.0 p.m.	290	Fire left untouched overnight.
2nd day.	7.0 a.m.	180	Fire stoked up.
	6.30 p.m.	250	Fire drawn and manure left to cool overnight.

Grinding the Manure.—The manure is ground in a Size 22 high-speed disintegrator, in which four beaters pulverize the material, and the powder produced is carried by air draught through the screens at the bottom, resulting in rapid and cool grinding. The bottom screens have for this purpose been changed from $\frac{1}{8}$ in. to $\frac{1}{16}$ in. mesh to allow the passing of ground feathers. This machine works best at 3,300 revolutions per minute, and the material being friable, it will take lumps up to 5 oz. in weight. An automatic feed has not yet been found to give satisfactory results, but experiments are in progress. Latterly, the grinding has been carried out in the main food store, power being supplied by an 18 h.p. engine used also for grinding and kibbling the food.

Composition of the Undried and Dried Ground Manure.—Obviously, from the great variation in moisture content, already mentioned, the material as collected varies considerably in analysis. Sampling, to obtain a representative specimen, is also difficult, but the average of a number of samples collected at different times of the year worked out as follows :—

	<i>Undried manure</i>					<i>Per cent.</i>
Moisture	52.93
Organic matter	29.30
*Total nitrogen	2.12
Total potash (K_2O)	0.60
Total phosphoric acid (P_2O_5)	1.21
Total calcium (CaO)	1.16

* Containing ammoniacal nitrogen 0.416 per cent.

Provided the material is spread out in a very thin layer, it may be air-dried (without the application of heat) to yield a dry product with very little loss of nitrogen; but it is

impossible to do this on a commercial scale on account of the large drying space required and the length of the process. Although kiln-drying does result in some loss of nitrogen, the results of this investigation show that the loss is not excessive and does not invalidate the method of drying. Analyses, before and after kiln-drying, have shown that approximately one-fifth of the total nitrogen present in the wet material is lost during the drying process, this loss being, in effect, almost identical with the amount of nitrogen present as "ammoniacal" nitrogen (as determined by the usual methods of analysis) present in the wet material.

The kiln-drying of the first few experimental lots was not carried far enough, and the final product showed a moisture content of from 16 to 20 per cent., and would not store satisfactorily. Indeed, small samples, stored in bags in well-ventilated surroundings, soon began to show signs of mould. With experience in the control of the firing, depth of material, etc., it has been possible to produce regular supplies of the kiln-dried material with a moisture content of from 7 to 10 per cent., and this stores quite satisfactorily.

The following table shows the average analysis of a number of samples of dried manure obtained after experience in operating the kiln, and, for the sake of comparison, analyses of other "organic" manures have been included :—

	<i>Kiln-dried poultry manure</i>	<i>Castor meal</i>	<i>Rape cake</i>
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Moisture	7.75	8.00	10.10
Organic matter	57.04	91.00	89.90
Total nitrogen	4.31	4.50	5.30
Total potash (K_2O) ..	1.28	1.90	1.50
Total phosphoric acid (P_2O_5)	2.92	1.60	2.50
Total calcium (CaO) ..	3.55	1.00	—

The above table shows that it is possible to produce dried poultry manure of a similar analysis to other organic fertilizers at present in considerable demand in market gardening areas. Based solely on the value of its manurial constituents, as compared with the cheapest artificial fertilizers at May, 1932, prices, the dried poultry manure would be worth £2 per ton ; but, during the spring of this year, the organic manures cited as of similar analysis have been selling freely in market garden areas in the Cambridge province at £3 10s. 0d. to £5 per ton. It is of interest to note, also, that a considerable proportion of the plant nutrients in the dried poultry manure are present in a readily available form, one-fifth of the nitrogen,

three-quarters of the potash and one-fifth of the phosphoric acid being soluble in cold water.

Cost of Collecting, Drying and Grinding.—As the work has been largely experimental up to the present, it is not possible to give exact figures for the cost of drying and grinding the manure under settled commercial conditions. It is possible, however, to give approximate figures for this particular experiment, and it is hoped that the details will be of assistance to those interested. The following costs are based upon an output of 4 tons of dried manure per week :—

(1) <i>Capital expenditure</i> :—	£	s.	d.
Cost of kiln (including stokehole shed) ..	£210		
Cost of drying-shed	25		
Cost of grinding-shed	100		
Cost of disintegrator	100		
	<hr/>		
	435		

On this expenditure, 15 per cent., or £65 per annum, should be allowed for depreciation and interest. On a production of 4 tons of dried ground material per week, the cost for 4 tons is	1	8	0
Half-proportion of 15 per cent. for depreciation on an 18-h.p. engine costing £200, per 4-ton lot ..	0	5	0

(2) *Collection* :—

The manure is brought back from each group of houses after taking out the food, etc. The costs are apportioned between these two operations, and the proportion for a 4-ton lot of dried material is	1	0	0
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(3) *Drying* :—

One man will dry and grind 4 tons per week :			
Labour charges	£2	5	0
Fuel—6 cwt. of coal and coke at 30s. per ton	0	9	0
	<hr/>		
		2	14 0

(4) *Grinding* :—

Fuel, etc.— Engine costs are $\frac{1}{4}$ d. per h.p. per hour, i.e., 9d. per hour.			
One 4-ton lot can be ground in 8 hours	0	6	0
Beaters : one set used for 20 tons (proportion) ..	0	2	0
Screens : one set used for 20 tons (proportion) ..	0	5	0

Total cost for 4 tons	£5	17	0
Cost per ton : £1 9s. 3d.			

Uses of the Manure.—The material produced after grinding is a fine, dry powder, rather bulky, and not easily applied to the land by hand under ordinary conditions. When applied with a manure distributor of the Westphalian type, there is some difficulty in sowing quantities over 10 cwt. per acre on account of the lightness of the material; a certain amount of dust is also produced. On the other hand, for admixture

with mineral manures the material is excellent, and plays the part of a drier, in the same way as steamed bone-flour.

Results from field trials in the use of this manure for arable crops are not yet available, but quantities of the manure have been supplied to various centres for trial purposes. Applied to golf greens, fairways and lawns the manure has produced effects similar to those of other organic nitrogenous fertilizers and lawn foods. Greenhouse pot cultures have, so far, shown the material, produced in this manner, to be remarkably free from viable weed seeds.

Conclusion.—It has been demonstrated that poultry manure can be satisfactorily dried in a kiln similar to that used in maltings. It is hoped that these investigations, having shown that the problem of drying poultry manure is not incapable of solution, will encourage further efforts to devise a simpler and more efficient process.

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MARKETING NOTES

National Mark Wheat Flour.—Preliminary investigations are being made by the Ministry as to the possibility of extending the Scheme to enable the National Mark to be used in connexion with biscuits. Opinions expressed so far indicate that, subject to the necessary amendment being made to the present standard grades of National Mark flour, biscuit makers who are in the habit of using all-English flour would welcome this extension next year.

Following upon the decision to permit the enrolment of local grocers' associations in the scheme, under conditions that would permit the associations to delegate to their members the right to pack National Mark flour under their own names (see the July issue of this JOURNAL, p. 362), the Kettering and District Grocers' Association has applied for and been granted authorization to re-pack National Mark flour.

National Mark Canned Fruit and Vegetables.—The total number of canners authorized to apply the National Mark to their produce is now 40, operating 52 factories. The following new firms have recently been authorized :—

Maconochie Bros. Ltd., Millwall, London, E. 14.

Stratford-on-Avon Produce Canners, Ltd., Stratford-on-Avon.

St. Martin Preserving Co., Ltd., Slough, Bucks.

Baird, Wolton & May, Barming, Kent.

Bolsover Home Grown Fruit Preserving Co., Ltd., Bolsover, Derbyshire.

Norfolk Canneries, Ltd., North Walsham, Norfolk.

Batchelor & Co. (Sheffield), Ltd., Stanley Street, Sheffield.

English Preserved Foods, Ltd., Norfolk Street, Boston.

Worcestershire Canning Co., Ltd., Tenbury Wells, Worcs.

Wroxham Fruit, Ltd., Wroxham, Norfolk.

County Canning Co., Maldon, Essex.

T. E. Davies, Madley, near Hereford.

Several of the factories operating for the first time this year are of a large type, and the rebuilding and extension of several others have resulted in a marked increase in factory capacity. The Home Counties and south-eastern England are now the main fruit-packing areas, while the Eastern Counties continue to lead in the packing of vegetables.

Considerable progress has been made in technical efficiency by authorized canners, particularly in respect of scientific control in the factories and supervision and methods of grading. The importance of field contact with growers is now appreciated and the cannery field-men are assisting in the solution of canner-grower problems. Now that an even flow of bulk supplies is assured, retailers are anxious to stock home-produced canned fruit and vegetables.

The guarantee of quality given by the National Mark has necessitated periodical visits of inspection to all factories. Approximately 1,000 samples of the products have been collected by the Ministry and submitted to Campden Research Station for examination, the canners being informed promptly of the quality of each sample under test. This control ensures that the standards to which National Mark canned fruit and vegetables are packed are the highest attainable in practice.

National Mark Bottled Fruit and Vegetables.—The list of authorized packers under this Scheme has been further extended by the enrolment of the three following firms:—

S. Whittaker, Ltd., Paragon Works, Cornbrook, Manchester.

E. Geldart, Ltd., Meersbrook, Sheffield.

Messrs. W. G. & F. S. Cornick, Bridport, Dorset.

In addition, the Co-operative Wholesale Society, Ltd., have been authorized in respect of their factory at Lowestoft.

National Mark Honey.—The list of authorized packers under the Scheme has been extended by the enrolment of 12 commercial beekeepers and of the following additional associations of beekeepers:—

Herefordshire Beekeepers' Association, The Home Farm, Byford, Bridge Sollars.

Kent Beekeepers' Association, The Chestnuts, Lane's End, Dartford.

Shropshire Beekeepers' Association, "Coilroi," London Road, Shrewsbury.

Soke of Peterborough, Oundle and District Beekeepers' Association, 104 High Street, Old Fletton, Peterborough.

Staffordshire Beekeepers' Association, 4 Tillington Street, Stafford.

Worcestershire Beekeepers' Association, Parkside, Hallow, near Worcester.

Yorkshire Beekeepers' Association, Moss Vicarage, Doncaster.

Marketing Demonstrations.—The following marketing demonstrations have been arranged for the autumn :—

<i>Show</i>	<i>Date</i>	<i>Subject</i>
London Dairy Show (Agricultural Hall)	Oct. 19-21	National Mark Display ; Butter.
Imperial Fruit Show (Birmingham)	Oct. 21-29	National Mark Fruit ; Broccoli and Lettuce ; National Mark Canned and Bottled Fruit and Vegetables ; Cider ; Honey.
Birmingham Cattle Show (Birmingham)	Nov. 26- Dec. 1	Mutton and Lamb.
Smithfield Club Show (Agricultural Hall)	Dec. 5-9	Mutton and Lamb.

Displays of National Mark and other Home Produce.—Home produce of appropriate kinds was displayed at the International Confectioners' and Bakers' Exhibition (September 3-9) and at the International Grocers' Exhibition (September 17-23), held at the Agricultural Hall, London. A special feature of the England and Wales Stand at the latter Exhibition was a display of Cheshire dairy produce arranged by the Cheshire Cheese Federation. The Ministry also arranged a separate educational exhibit in connexion with the National Mark schemes.

A display of National Mark produce was staged at the Rochdale Chamber of Trade Exhibition (September 14-24). The Exhibition was opened by H.R.H. Princess Royal, who made special reference to the National Mark schemes as a means of increasing the consumption of home-produced food-stuffs. National Mark produce was also displayed at the Bradford Chamber of Trade Exhibition (September 28-October 8).

The Ministry, in conjunction with the National Farmers' Union and other organizations concerned, undertook, in the interests of England and Wales, the first fortnight's tenancy (September 26-October 8) of the Empire Shop, St. John's Square, Cardiff, which the Empire Marketing Board are placing at the disposal of the various countries of the Empire for fortnightly periods.

Publicity for National Mark Produce.—The Ministry leased the Empire Marketing Board's advertising frames throughout England and Wales in the first three weeks of September for the display of a poster set advertising National Mark eggs, canned fruits, canned vegetables, tomatoes, cucumbers, and beef (in the beef-grading areas only). The posters illustrated the National Mark labels or grade marks in use for these products and emphasized that the National Mark is not applied indiscriminately to home produce as a mark of origin, but that every label or grade mark, in addition to the Mark itself, shows the statutory grade of the product, and is an indication of the guarantee of quality and home origin which the use of the National Mark implies.

A National Mark Shopping "Week" was held at Rochdale, September 14-24, in association with the Ministry's display of National Mark products at the Rochdale Chamber of Trade Exhibition. A window-dressing competition open to grocers and other retail traders who stock National Mark products was arranged, and, through the courtesy of the proprietor, the Ministry's National Mark films were shown at a local cinema to the senior school children. A Committee representative of local trading and other interests co-operated with the Ministry in the organization of the "Week."

National Mark Flour at the Confectioners' and Bakers' Exhibition.—The competitions at the Confectioners' and Bakers' Thirty-sixth International Exhibition held at the Royal Agricultural Hall, London, last month, attracted a satisfactory number of entries in the classes in the Bread and Flour sections relating to National Mark flour. In the Bread Class 58, for the best 2-lb. All-English commercial tin loaf made wholly from National Mark flour, 46 loaves came before the Judges. The winners of the prizes of £10, £5 and £3, respectively, offered by the Ministry were (1) Mr. J. R. Irons, London, (2) Mr. W. D. Baldwin, Woodbridge, and (3) Mr. W. C. Hurley, Chippenham. Prizes of similar amounts were given by the National Farmers' Union in Class 61 for the best All-English commercial milk loaf (tin) made from National Mark flour. Messrs. Irons and Hurley also took first and second prizes, respectively, in this class, in which there were 44 entries. The third prize was secured by Mr. L. W. Jenkins, London. The bread submitted in both classes created a favourable impression, and the competitions again demonstrated the possibilities of National Mark Yeoman flour for producing a commercial loaf of good volume and colour, and of fine flavour.

In the British Wheat Flour Competition, the class for National Mark *All-English* (*Yeoman*) Wheat Flour (Class H), confined to authorized millers of National Mark flour, attracted a larger entry (16) than any of the other seven classes in the competition. The winners of the gold, silver and bronze medals and diplomas offered by the Ministry in this class were :—

- (1) Co-operative Wholesale Society, Ltd., New Barns Mill, St. Albans.
- (2) Green Bros., Rayleigh Flour Mills, Maldon.
- (3) Clark & Butcher, Ltd., Soham.

In addition, the Ministry offered a gold medal to the farmer supplying the largest proportion of the wheat used in the winning flour. This was gained by Mr. C. W. Byford, of Cliftons Farm, Clare, Suffolk.

Film Van Tours.—The tours with the two talking-film vans (referred to in the July issue of this JOURNAL, p. 363) that have been touring the country in connexion with the National Mark movement terminated at the end of August. In all, these two vans have given 484 performances, each with an address by the officer in charge, to audiences totalling approximately 142,000. They have been the means of bringing the National Mark to the notice of the public in areas that have not been reached by other forms of publicity.

Union of South Africa : Meat Trade Control.—An important stage in the scheme of the South African Government for promoting a revival of the Union's meat industry has been reached with the passing of the *Meat Trade Control Act*, 1932, as a result of which a Meat Control Board came into being on August 1. The Board, which consists of three members nominated by the Minister of Agriculture—a representative of the producers, a representative of the meat trade, and an officer of the public service as Chairman—is, in the first place, an advisory body, but it may be empowered by proclamation of the Governor-General to determine the maximum numbers of slaughter animals (cattle, sheep and goats, or pigs) or the maximum quantities of meat that may in any stated period be transported by rail into or out of any defined area. Similarly, the Board may determine the maximum numbers of such animals that may be sold or offered for sale on any day in any specified market. Contracts entered into before the date of commencement of the Act may be cancelled by either party thereto within 30 days after the promulgation of a proclamation. The Governor-General may also by proclamation fix the maximum prices at which meat of stated classes

may be sold (otherwise than by public auction) in certain places or areas. Further, he may make regulations generally for giving effect to the objects of the Act and in particular for prescribing the manner in which the Board shall exercise its powers and functions. The Agricultural Produce Export Acts and the Perishable Products Export Control Acts are not affected by this measure.

Further comprehensive legislation has been promised, which it is understood will provide, among other things, for a levy on cattle and sheep, control of markets, sale of cattle by weight, and co-operative cold-storage.

Latvia : Measures for Promoting the Pig Industry.—The Latvian Parliament has recently passed a law that has for its object the encouragement of pig production in Latvia. The main provisions of the law are summarized below :—

(1) The State will guarantee farmers a price of from 0.75 to 0.85 lats. per kilogram live-weight (30s. 2d. to 34s. 3d. per cwt. at par and about 42s. to 48s. at current rates), according to grade, for pigs that are suitable for bacon and are sold to export slaughter-houses.

(2) In the event of prices on the London market for Latvian bacon No. 1 falling below the level that covers the payment of the guaranteed minimum prices for live pigs, the Ministry of Agriculture will pay pig producers the difference. Average prices over a month are used, and a fixed formula allowing for freight, offals, etc., is employed in reckoning the live-weight price represented by a given bacon price.

(3) In the event of prices on the London market for Latvian bacon No. 1 rising above a level that covers the payment of the guaranteed minimum prices for live pigs, 50 per cent. of the increase is to be paid to a special fund, from which, in the event of a fall in prices, the payments are to be made to producers as explained in paragraph (2).

(4) A Price Quotation Commission at the Latvian Ministry of Agriculture is to determine and publish the course of prices at home and on the London market each week. The Commission is to consist of representatives appointed by the Ministries of Agriculture and Finance and the State Controller. In accordance with the prices determined by the Commission, the Ministry of Agriculture, in the event of a fall of prices, is to make the payment mentioned in paragraph (2). The amount of this payment and also of the contributions to be made to the fund mentioned in paragraph (3) are fixed by the Price Commission.

(5) In making the payments referred to in paragraph (2), the Ministry of Agriculture will make deductions by instalments to cover any outstanding loan for seed and fodder granted up to June 1, 1932. Producers who have no debts of this sort are to receive payment in cash. The funds for this purpose are to be provided for in the Budget.

The law came into force on July 1, 1932, and repeals the law of July 22, 1931, which also aimed at the promotion of pig production.

Morocco : A National Mark for Fruit and Vegetables.—Regulations for the establishment of a voluntary system of inspection of fruit and vegetables intended for export from Morocco were made on May 12, 1932.

The Regulations provide *inter alia* for the institution of a National Mark guaranteeing the origin, quality, condition and classification of any fruit and vegetable to which such mark may be applied. The standards to which these fruits and vegetables must conform, and the conditions under which the Mark may be applied, will be determined by decrees issued by the Director General of Agriculture.

A duty of 0 fr. 15 c. will be collected in respect of each package of fruit and vegetables to which the National Mark is affixed.

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OCTOBER ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,

Director of Agriculture for West Sussex.

Plans for the Future.—The farming year is a somewhat indefinite period and varies with the district and the type of farming. On arable land each crop has its place and is influenced by the preceding crop or has an effect on the succeeding crop—all being part of a plan. Modifications of cropping and stocking require forethought and time to bring into operation, and before they can have full effect the circumstances that have made them desirable may have materially altered.

In recent years arable land has decreased in amount and permanent pasture has increased, and during the past two years cattle, sheep and pigs have increased so much that the number of cattle is at the highest figure so far recorded, sheep are greater in number than in any year since 1911 and the total of pigs is higher than in any year with the exception of 1924.

Such changes have been forced on the farmer by economic conditions, but the fall in prices that some years ago was so

great in cereals has now come to live stock and live-stock products.

It is difficult to see what is in front of British farming at the present time or what general change would best meet the economic conditions. It would appear that to provide a livelihood for those engaged in the industry increased production may be less desirable than reduced cost of production of both crops and live stock—including live-stock products. In this work each farmer must consider his own conditions. In some instances more efficient cultivation and well-balanced manuring may cheapen the cost by producing larger crops, and where live stock are concerned a smaller number of healthy, thrifty animals may give better returns than a much larger number only doing indifferently. In milk production the market problem might be solved if the dairy herds of the country were more drastically culled.

The general system of British farming, under which crops are grown in rotation and live stock and arable farming go together, is sound practice.

Land that has to be maintained in fertility for generations requires organic fertilizers, and the fertility of the soils in these islands is a result of stock farming. The extremely lasting character of farmyard manure has been well illustrated on the grass land at Rothamsted. One plot received 14 tons of dung per acre per annum for eight years (1856-1863) and then was left unmanured; this plot has continued to give a larger crop than the unmanured plot alongside after nearly sixty years.

The classical experiments at Rothamsted have shown that soil fertility can be kept at a certain moderate level by the use of artificial fertilizers alone without the use of farmyard manure. In general, however, the growth of the crop was not enough to keep down weeds, and much expense had to be entailed in cleaning. In recent years a combination of artificial fertilizers with occasional fallows has been tried, and has proved effective in maintaining yields at low expenditure in labour, but with a loss of crop in the fallow year. In certain circumstances and under certain conditions this may be good economic practice, and would appear to fit in with farm "mechanization" where the labour of carting and spreading farmyard manure or the folding of sheep would otherwise entail the employment of manual labour to such an extent that the benefits of "mechanization" might be reduced.

Complete mechanization and the elimination of live stock is

not likely to suit an appreciable proportion of the farm lands of England, and it is more than likely that the land will be more and more utilized, both as arable and pasture, for the maintenance of live stock and the production of live-stock products, with selected areas producing fruit and vegetables.

Autumn Cultivations.—It is good practice to carry out as many cultivations as possible in the autumn months. Breaking up the stubbles either by special stubble breakers or by shallow ploughing or direct by cultivators should proceed as early as possible after harvest, cultivation being pursued with the object of eliminating all perennial weeds and encouraging the growth of seeds of annual weeds. Cleaning of the land in autumn is most important in districts having a mild winter climate, as unless it is checked the weed growth will continue during winter and be more difficult to deal with in spring. Where farmyard manure is being applied in autumn, weeds should first be destroyed or removed, or their growth will be stimulated by the manure and the more abundant growth thus produced will add to the difficulties at a later date. It is important to recognize that unless cultivations are very thorough they may be worse than useless and may simply increase the weed growth.

Efficiency cannot be measured by the number of ploughing, cultivating or other operations pursued unless these are in such sequence and are so timed as to bring about the desired condition.

By good autumn cultivation perennial weeds can be materially reduced, but it is less effective in directly reducing annual weeds, the seeds of which do not germinate readily in late autumn. Good cultivation, however, by eliminating perennial weeds of the couch or water-grass type, allows a sown crop a better chance to succeed, and nothing could better hold annual weeds in check than a good crop. There is no more advantageous way of keeping land clean than by growing full crops, but they must start right, free from weed competition : hence the stress laid on weed elimination before the crop is sown.

Preparations for Cereal Sowing.—The severely laid and twisted condition of many of the winter oat crops in the southern counties during the past harvest has made many farmers wonder whether winter oats are really worth cultivating. There is a distinct need for an oat hardy enough to carry safely through the winter and with a good standing straw. On the other hand, there is a real advantage in having a part of the cereal crop in winter oats, as it ensures a better distribution of

labour, sowing and harvesting coming before wheat, so that both labour and implements can have a greater number of working days. The yield is also satisfactory, but it is possible that the assured market for wheat will tend to reduce the area under winter oats at the present time.

In the south wheat is the most important cereal crop and is sown mainly in autumn. It may follow a bare fallow or peas, beans or clover with a minimum of manuring. When taken as a second grain crop suitable manuring will be required. Wheat prefers a stale furrow and the seedbed should be firm. In Sussex the use of the furrow presser was at one time universal and the seed was broadcast. The introduction of disk drills reduced the amount of furrow pressing, but greater importance is again being given to the system of pressing the furrow, and where time and labour will allow, a good practice is to broadcast half the seed on a pressed furrow and harrow down the furrows after which the other half of the seed can be drilled across the furrows.

Treatment of all cereal seeds to destroy fungus spores present on them should never be omitted. The dressing of wheat has been fairly general in the past, but oats have been less frequently treated. So long as wet dressings were the only efficient type available there were certain disadvantages in dressing seed. The exact amount of liquid to use to cover the seed fully and yet avoid getting it too wet, and afterwards to get it dry enough to flow evenly through the drill, could be gauged by care and experience, but the injury to germination that was appreciable with some dressings was a decided disadvantage. An account of Cereal Smuts and their Control is given in the Ministry's Bulletin No. 24.*

Live Stock.—In many districts the summer rainfall has been more than usual, and troubles such as husk or hoose and liver fluke may be more prevalent. Young stock should be carefully watched for these troubles, and if any symptoms appear it is well that the animals should be housed and well nourished. If the infection is severe veterinary advice should be sought, but careful feeding and good housing should bring the animals through a slight attack. With sheep, movement to higher and drier land is advisable wherever this is possible, and some dry food is beneficial. Where the attack is general treatment is necessary. With suitable weather stock should continue to do well through this month, and changes of pasture are beneficial as growth is slower, and when grass is continuously grazed the

* H.M. Stationery Office, Kingsway, London, W.C. 2, price 5d. (post free 6d.).

new growth is consumed so readily that the total amount is reduced. Alternation of pastures is most desirable at this season of the year, and for cattle some area should be reserved for feeding after Christmas wherever outwintering is practised.

For breeding sheep of grassland type a good fresh pasture should be available to which they should be moved before mating. It is necessary to create an improving condition in the flock of ewes at this period in order to ensure a good crop of lambs.

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NOTES ON MANURES

H. V. GARNER, M.A., B.Sc.,
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Phosphates for Potatoes.—It is an almost universal practice for potato growers to use a certain amount of phosphate in their manure mixtures, and superphosphate is by far the commonest form in which it is applied.

During the past four seasons, field experiments have been conducted at several centres, using modern methods of plot arrangement, to ascertain the degree of response of the potato crop to superphosphate under various soil conditions. Latin Squares have been employed in most instances, although, in the larger experiments, other more efficient arrangements have been adopted. The usual plan has been to test successive levels of phosphatic manuring, beginning at nothing and working up, by four equal increments, to a heavy dressing of from 8-10 cwt. superphosphate per acre. Ample amounts of sulphate of ammonia and sulphate of potash have been applied to all plots. Surveying the results as a whole, the following points emerge. The most effective application of superphosphate was the initial dose, usually measured at $2\frac{1}{2}$ cwt. per acre. This does not mean that such a dressing is the maximum which could be profitably used, but that the increment in crop produced by the first dose was greater than that produced by the second dose over the first, or the third dose over the second. Taking the performance of the first application we find that out of 30 trials comprising five seasons and 16 centres :—

Good responses (from 5-24 cwt. potatoes per 1 cwt. superphosphate applied) were obtained in 12 trials.

Fair responses ($1\frac{1}{2}$ -4 cwt.) in 8 trials.

No response in 9 trials.

A significant depression in 2 cases.

The overall effect of the first dose was to give 5 cwt. increase in the crop per 1 cwt. of superphosphate used, or about 12 cwt. for the $2\frac{1}{2}$ cwt. actually employed.

In ten of the trials the response continued up to the highest level used (8-10 cwt. of superphosphate), and of these, two were on light soils at Woburn and Haverfordwest, four were on a rich silt near Wisbech, and the remaining four were on fenland soils. In two other instances, the second dose was the maximum while, in the remaining 12, there was no increase beyond the first dressing.

The most responsive soils tested were the fen soils. The rich silts responded well to the first dose, but the subsequent improvement was slight. In both instances, the level of yield obtained was high.

	<i>Fen soils</i> <i>Mean of 4 expts.</i>	<i>Silt soils</i> <i>Mean of 6 expts.</i>
Yield with no phosphate	8.18 tons	13.6 tons
Increase for 2½ cwt. superphosphate	—	11 cwt.
" " 5 " " "	28 cwt.	14 "
" " 10 " " "	48 "	16 "

On the majority of mineral soils, it appears that a dressing of about 4 cwt. superphosphate per acre is enough for the potato crop. If more is used, return must be sought for in subsequent crops of the rotation rather than in the potatoes themselves. The action of a large dose of phosphate at the beginning of the rotation, as compared with separate dressings applied to the successive crop, has not been tested experimentally, but, in the case of water-soluble phosphate, there is something to be said for applying it individually to those crops that are most benefited by it.

Basic Slag.—Basic slag is the best known phosphatic fertilizer for use on grass land. Many farmers will now be placing their orders for the coming season, and a few notes on the purchase of slag may therefore be in place. The first point that presents itself is the question of grade. Slags are sold with a guarantee of the total amount of phosphoric acid they contain. This is the legal form of the statement, but most farmers still think in terms of phosphate of lime rather than of phosphoric acid. Phosphoric acid may be converted into the corresponding amount of phosphate of lime by multiplying by the factor 2.18. Thus a slag containing 14 per cent. of phosphoric acid has a grade of 30 per cent. in terms of phosphate of lime. British basic slags range from 9 to 16 per cent. of phosphoric acid. The grades containing 18 per cent. of phosphoric acid are imported. The choice between the various grades of slag is unfortunately not entirely a matter of unit price at buyer's station. This is, of course, readily ascertained from the quotations by working out the

cost of 1 per cent. of phosphoric acid delivered, but will give misleading results unless attention is paid to the further point of citric solubility.

Slags may be divided into two broad groups in respect of the ease with which the contained phosphoric acid passes into solution under standard conditions. The solvent used is dilute citric acid, and the amount of phosphate dissolved is expressed as a percentage of the total amount of phosphate originally present in the slag. In one group of slags, the high-soluble, 80 per cent. or more of the total phosphate is citric soluble; in the other group the amount is less than 80 per cent. and usually of the order of 40 per cent. or less. The slags in the high-soluble class usually carry a guarantee of 80 per cent. citric solubility, but it is not compulsory to provide this, although, if the statement is made, it has the force of a guarantee.

In general, experiments have shown that the high-soluble slags are distinctly quicker in action than the others, and this is usually reflected in their price, those bearing the guarantee of 80 per cent. solubility being slightly more expensive per unit. It is now clear that, in comparing values by means of the unit price, high-soluble slags can safely be compared on this basis; also, low-soluble slags may be compared among themselves. High-soluble slags will only be comparable, however, with low-soluble if the object is to decide whether the price inducement in favour of the low-soluble slags is sufficiently great to compensate for their somewhat slower action.

There is, further, the question of the lime content of basic slag. The effect of this is not negligible and, as a rough estimate, it may be taken that basic slag has a neutralizing value equal to that of its own weight of carbonate of lime. Now, since slags are primarily used to supply phosphoric acid, more weight of a low-grade slag than of a high-grade slag must be applied to an acre in order to furnish a given amount of phosphate. In extreme cases, twice as much low-grade material is necessary. This furnishes an amount of lime roughly corresponding to the dressing, so that the liming effect of the low-grade slags is somewhat higher than that of the high-grade providing equal phosphate. Too much stress should not be laid on this, but, where the soil is in need of lime, it is a point to consider in deciding on the type of slag, in addition to the unit price of phosphate.

Nitrogen for Arable Crops.—It has been mentioned from time to time in these Notes that nitrogenous fertilizers are,

as a rule, the most active in promoting yield-increases in ordinary arable crops. This applies with most force to soils, low in organic matter, on which dung is not used in large quantity, and which carry seeds for one year only. In districts of high rainfall, or where long leys are the rule, nitrogen is less necessary, and may be actually harmful for grain crops; while, on the fenland, its use is confined to roots, or it may be withheld altogether.

There are now available two years' results from the rotation experiments at Rothamsted and Woburn, bringing out the value of nitrogenous fertilizers under conditions definitely favourable to their action. No dung is used in the six-course rotation in question, although green manuring with mustard and sugar-beet tops is practised. The nitrogen is supported by suitable additions of phosphate and potash. The effect of nitrogen is determined by using a scale of dressings rising from 0 to 3 cwt. of sulphate of ammonia per acre, whence the mean performance of 1 cwt. of sulphate of ammonia over that range is calculated. The results may be set out as follows:—

	<i>Increase in cwt. per acre for 1 cwt. of sulphate of ammonia</i>			
	<i>Rothamsted</i> 1930	<i>Woburn</i> 1930	<i>Rothamsted</i> 1931	<i>Woburn</i> 1931
Sugar-beet, roots	—	7.4	11.8	10.8
„ tops	2.7	11.2	—	—
Barley grain ..	2.2	2.8	2.4	4.1
„ straw ..	—	5.6	3.9	—
Seeds hay ..	8.0	—	—	—
Potatoes ..	—	30.4	—	—
Wheat grain ..	—	—	3.4	3.4
„ straw ..	—	—	8.4	7.5
Forage (dry matter)	4.0	—	6.1	5.7

In the experiments under notice, there were 30 determinations of the response to nitrogen, with parallel-series testing potassic and phosphatic effects. There were 20 cases, as shown above, of significant responses to nitrogen. In the remaining 10 instances, although the yields with nitrogen were higher than those without, the differences were not big enough to be conclusive on the results of a single season.

The yields with potash and phosphate were usually greater than the controls, but only reached the level of significance on five occasions. Potash strikingly increased the yield of potatoes at Rothamsted in both years, and increased sugar-beet roots, tops and sugar-percentage at Woburn in 1931.

¹In these experiments, the mean production of dry matter over all crops has been above 4 cwt. per 1 cwt. sulphate of

ammonia. As many other experiments have shown, barley grain is one of the crops most certain in its response to nitrogen. It has given significant increases in each of the above trials, the mean results being 2.9 cwt., or 5.8 bushels of grain.

With the present cheap rates for nitrogenous fertilizers, these results deserve consideration when framing the fertilizer programme for the coming year.

PRICES OF ARTIFICIAL MANURES

Average prices per ton during week
ended September 7

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	8 8	8 8	8 8	8 8	10 10
" " Granulated (N. 16%) ..	8 8	8 8	8 8	8 8	10 6
Nitrate of lime (N. 13%) ..	7 5d	7 5d	7 5d	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20.6%) ..	5 5d	5 5d	5 5d	5 5d	5 1
Calcium cyanamide (N. 20.6%) ..	6 15s	6 15s	6 15s	6 15s	6 7
Kainit (Pot. 14%) ..	3 6	2 19	2 18	3 3g	4 6
Potash salts (Pot. 30%) ..	5 4	4 19	4 19	5 2g	3 5
" " (Pot. 20%) ..	3 15	3 8	3 8	3 13g	3 8
Muriate of potash (Pot. 50%) ..	9 15	9 11	9 1	9 11g	3 10
Sulphate " (Pot. 48%) ..	11 10	11 7	11 0	11 8g	4 9
Basic slag (P.A. 15½%)|| ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)|| ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock-phosphate (P.A. 26-27½%)|| ..	2 10a	2 8a	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%) ..	3 2	..	3 4	2 16k	3 6
" (S.P.A. 13½%) ..	2 17	2 9	3 0	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	..	6 15	7 5	6 2	..
Steamed bone-flour (N. 4½%, P.A. 27½-29½%) ..	5 15	5 2f	6 0	4 15	..

Abbreviations : N. = Nitrogen ; P.A. = Phosphoric Acid ; S.P.A. = Soluble Phosphoric Acid ; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‡ Fineness 85% through standard sieve.

§ Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails ; southern rails, 2s. 6d. extra.

¶ Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

‡ For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

• Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

§ Prices shown are f.o.r. northern rails ; southern rails, 2s. 6d. extra.

‡ Prices shown are f.o.r. northern rails ; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc. (Agric.),
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Winter Feeding of Dairy Cows.—The four main principles in the rationing of dairy cows have been laid down by Mr. James Mackintosh as follows :—

- (1) To feed a standard maintenance ration.
- (2) To feed a balanced production ration.
- (3) To feed according to milk yield and to adjust the amount of bulk according to the cow's appetite and capacity.
- (4) To prepare cows for their lactation.

In regard to items 3 and 4, the necessity for regulating bulk, and the value of preparing cows and heifers for their lactations, have been specially studied and their importance emphasized from time to time by Mr. R. Boutflour. How far the intensive feeding of cows for maximum milk production may affect wastage in herds is a point on which fresh light may be thrown by study of the information which is now being collected. There is widespread opinion amongst observant herd managers that specially intensive feeding has its dangers, but this question can only be settled by systematic and trained investigation.

Somewhat extravagant claims have been made from time to time as to the value to the farmer of scientific rationing. An example has often been quoted of the farmer who reported a saving of 6s. per day on feeding stuffs, and an increase of 7 gallons of milk per day, as the result of adopting certain principles of rationing. This, however, is not the whole story of milk production and the more sceptical farmer still requires to be assured that there is no "snag," as regards breeding and udder troubles, which play such a very important part in reducing the net income from the sale of milk on dairy farms. It is time for all to realize that the production of 2,000-gallon cows or heifers is not, in itself, proof that the system of rationing adopted to secure these abnormally high yields is likely to prove the best or even the advisable system of rationing on an ordinary commercial mixed farm. On such a farm, where the production and sale of milk is but a part of the whole farming business, the dairy herd cannot claim the full-time skilled supervision of the farmer himself or his manager. Intensive feeding for very high yields requires constant and highly skilled supervision if it is to be successful.

The net result of the work carried out in recent years in regard to the maintenance requirement of cows has been to show that, with capable management, cows can be made to

milk well in winter on hay, without roots or other home-grown green fodder ; and to milk equally well on roots alone, without hay. Numerous illustrations have been put forward to prove the point that hay alone forms a sufficiently suitable maintenance ration, while the noted example of the value of roots was that of Mr. F. B. May's herd, which, in 1917, had an average of 1,334 gallons per cow on a maintenance ration consisting of from 66 to 84 lb. of roots (kohl rabi and mangolds) and $3\frac{1}{2}$ lb. of a mixture of oats and beans per cow. No hay or other fodder was included in this maintenance ration. Investigations in Sussex showed that the average milk yield per cow per day was 10.8 per cent. higher when roots were fed than when no roots were included in the ration. In practice, a maintenance ration anywhere between the two extremes of 20 lb. hay on the one hand and $\frac{1}{2}$ cwt of roots on the other has proved satisfactory, and within these limits the farmer can make up his maintenance ration to suit his convenience and the conditions of his particular farm.

The kind of maintenance ration that suits quite well is 3 to 4 stones of roots and 1 stone of hay per cow per day. This year, when potatoes are likely to be available in considerable quantity for stock feeding, it may be of interest to recall that, in special circumstances, a maintenance ration may be composed of 40 lb. of potatoes and 10 lb. of medium quality hay. When using potatoes, it is necessary to begin with small quantities, and to increase very gradually by giving slightly larger amounts daily. Potatoes are inclined to be laxative and should not be fed along with other laxative foods, but preferably should be supplemented with those of an astringent character, such as cotton cake. A maintenance ration including 40 lb. of potatoes will contain an excess of starch over maintenance requirements, and a sufficient concentrated supplement for each of the first two gallons of milk, in this case, is $1\frac{1}{2}$ lb. of decorticated cotton seed cake or meal or 3 lb. of undecorticated cotton cake.

In these notes for November, 1931, the writer dealt with the nutritive value of hay, both for maintenance and production purposes. It should be noted that 30 lb. of first-class hay supplies all the nutriment that is required for maintenance and for the production of up to 3 gallons of milk. Herd averages of 2 gallons per cow per day have been maintained on first-class hay alone, or on good hay up to 28 lb. together with 42 lb. of roots per head daily. Best quality hay is a very valuable feeding stuff for milk production as well as for stock feeding generally.

As regards purely production purposes, it is now accepted that it is sufficient to supply 2.2 lb. of starch equivalent and 0.5 lb. protein equivalent per gallon, as against 2.5 lb. and 0.6 lb. respectively, the quantities that were previously recommended. It is possible that these revised allowances of starch and protein may still be on the generous side. The cheapest feeding stuffs for inclusion in milk-production rations, meanwhile, are maize gluten feed, maize germ meal, and palm kernel meal, but comparative prices will, no doubt, alter as the season advances. For the farmer who has to buy all his concentrated foods, a suitably balanced milk ration cube has certain advantages as regards economizing labour in mixing and feeding, while the quantity used can be more easily checked, and controlled, than when several ingredients are included in a mixture.

The following "hay equivalent" may be of use as a rough guide in making up rations :—

- 1 lb. Good Hay = $\frac{1}{2}$ lb. mixed concentrates.
- = 2 lb. wet brewers' grains.
- = $\frac{2}{3}$ lb sugar-beet pulp.
- = 3 lb. silage.
- = { 3 lb roots, plus
- 1 lb. oat straw.
- = 4 lb. sugar-beet tops.

Where hay is scarce, and a part substitute for hay has to be purchased, feeders will find sugar-beet pulp a useful food to employ in order to eke out short supplies of hay, while in the neighbourhood of a brewery, or distillery, wet grains may prove to be a cheap partial substitute. It is not a bad plan to mix 1 lb. maize meal with each 10 lb. of wet grains to supply additional starch. This helps to maintain the cows' condition in the winter months.

Calf-Feeding : a Correction.—In the "Notes on Feeding," published in the June, 1932, issue of this JOURNAL, under the heading of "Calf-Feeding," reference was made, on page 282, to experiments in the feeding of calves by Professor H. Isaachsen, of the Royal Agricultural College, Norway. It was stated that "the Norwegian experiments were with skimmed milk as distinct from separated milk. It is recognized that skimmed milk contains appreciably more butter fat than separated milk, and this, no doubt, would, to some extent, account for the specially favourable results obtained." Professor Isaachsen has, however, written to say that his experiments were carried out with separated milk containing about 0.1 per cent. of butter fat. In the translation from the

original, the word "skimmed," as distinct from "separated," was used, but the Ministry desires to direct the attention of readers to this correction.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	6 13
Maize	78	7.6	5 0
Decorticated ground-nut cake ..	73	41.3	8 7
„ cotton cake	68	34.7	7 15

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.55 shillings, and per unit protein equivalent, 1.63 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The "food values," which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1931, issue of the Ministry's JOURNAL, p. 865.)

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 7
Oats	60	7.6	5 5
Barley	71	6.2	6 0
Potatoes	18	0.8	1 9
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 12
Beans	66	20.0	6 15
Good meadow hay	37	4.6	3 5
Good oat straw	20	0.9	1 12
Good clover hay	38	7.0	3 10
Vetch and oat silage	13	1.6	1 3
Barley straw	23	0.7	1 17
Wheat straw	13	0.1	1 0
Bean straw	23	1.7	1 18

* Obtainable from H.M. Stationery Office, Adelphi House, Kingsway, W.C. 2, price 6d. net.

DESCRIPTION	Price per qr.		Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	—	—	5 17	0 8	5 9	72	1 6	0-80	9-8
Barley, Canadian No. 3 Western	23 0	400	6 8	0 7	6 1	71	1 8	0-89	6-2
" Argentine	24 3	"	6 15	0 7	6 8	71	1 10	0-98	6-2
" Australian	24 6	"	6 17	0 7	6 10	71	1 10	0-98	6-2
" Persian	24 6	"	6 17*	0 7	6 10	71	1 10	0-98	6-2
Oats, English white	—	—	6 10	0 7	6 3	60	2 1	1-12	7-6
" " black and grey	—	—	6 13	0 7	6 6	60	2 1	1-12	7-6
" Canadian No. 2 Western	22 6	320	7 17	0 7	7 10	60	2 6	1-24	7-6
" " No. 3	21 9	"	7 12½	0 7	7 5	60	2 5	1-29	7-6
" " feed	14 3	"	5 0	0 7	4 13	60	1 7	0-85	7-6
" Argentine	18 6	"	6 10	0 7	6 3	60	2 1	1-12	7-6
" Russian	22 0	"	7 13½	0 7	7 6	60	2 5	1-29	7-6
Maize, Argentine	21 6	480	5 0	0 7	4 13	78	1 2	0-62	7-6
Peas, Indian	—	—	9 0†	0 14	8 6	69	2 5	1-29	18-1
" Japanese	—	—	23 5†	0 14	22 11	69	6 6	3-48	18-1
Milling offals—									
Bran, British	—	—	6 2	0 17	5 5	43	2 5	1-29	9-9
" broad	—	—	6 12	0 17	5 15	43	2 8	1-43	10
Middlings, fine imported	—	—	6 17	0 12	6 5	69	1 10	0-98	12-1
" coarse British	—	—	6 12	0 12	6 0	56	2 2	1-16	10-7
Pollards, imported	—	—	5 17	0 16	5 1	62	1 8	0-89	11
Meal, barley	—	—	7 7	0 7	7 0	71	2 0	1-07	6-2
" maize	—	—	6 0	0 7	5 13	78	1 5	0-76	7-6
" " South African	—	—	5 15	0 7	5 8	78	1 5	0-76	7-6
" " germ	—	—	6 0	0 11	5 9	79	1 5	0-76	8-5
" locust bean	—	—	6 5	0 6	5 19	71	1 8	0-89	3-6
" bean	—	—	8 0	0 17	7 3	66	2 2	1-16	19-7
" fish	—	—	14 10	2 7	12 3	59	4 1	2-19	53
Maize, cooked flaked	—	—	6 17	0 7	6 10	84	1 7	0-85	9-2
" gluten feed	—	—	6 2	0 12	5 10	76	1 5	0-76	19-2
Linseed cake, English, 12% oil ..	—	—	8 15	1 0	7 15	74	2 1	1-12	24-6
" " " 9% "	—	—	8 10	1 0	7 10	74	2 0	1-07	24-6
" " " 8% "	—	—	8 5	1 0	7 5	74	2 0	1-07	24-6
Soya-bean cake, 5½% oil	—	—	8 12*	1 7	7 5	69	2 1	1-12	36-9
Cottonseed cake—									
English, 4½% oil	—	—	5 15	1 0	4 15	42	2 3	1-20	17-3
Egyptian, 4½% oil	—	—	5 7	1 0	4 7	42	2 1	1-12	17-3
Decorticated cottonseed cake									
7% oil	—	—	7 15*	1 8	6 7	68	1 10	0-98	24-6
" " meal	—	—	7 17*	1 8	6 9	68	1 11	1-03	24-6
" " 7% oil	—	—	—	—	—	—	—	—	—
" " ground-nut cake, 6-7% oil	—	—	8 7	1 6	7 1	73	1 11	1-03	41-3
Palm-kernel cake, 4½-5½% oil ..	—	—	6 7½	0 11	5 16	73	1 7	0-85	16-9
" " " meal, 4½% oil	—	—	6 17½	0 11	6 6	73	1 9	0-94	16-9
" " " meal, 1-2% oil	—	—	5 17	0 12	5 5	71	1 6	0-80	16-5
Feeding treacle	—	—	5 0	0 8	4 12	51	1 10	0-98	2-7
Brewers' grains, dried ale	—	—	6 0	0 12	5 8	48	2 3	1-20	12-5
" " " porter	—	—	5 10	0 12	4 18	48	2 1	1-12	12-5

* At Bristol. † At Liverpool. ‡ At Hull.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of August, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealer's commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then find its material value is 20s. per ton as shown above, the food value per ton is 3s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 1s. 4d. Dividing this again by 22-4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1-50d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading material value per ton are calculated on the basis of the following unit prices:—N, 5s. 14; P₂O₅, 3s. 4d.; K₂O, 3s. 4d.

MISCELLANEOUS NOTES

There are 17 County Farm Institutes in England and Wales. Their primary object is to provide instruction in the scientific principles underlying sound farming practice and they have been specially

Courses at County Farm Institutes and extensively equipped for the purpose.

The instruction given is closely related to practice; this applies not only to general agriculture but also to market gardening, fruit growing, dairying and poultry-keeping. The subjects dealt with and their order of importance vary somewhat at the different institutes, but a typical curriculum includes the following: soils, manures, crops, livestock, feeding stuffs, implements and machinery, veterinary hygiene, surveying and mensuration, farm book-keeping, general agricultural science (biology and chemistry), horticulture, dairying, poultry-keeping, bee-keeping and fungus and insect pests. Most of the courses start in October, one term being taken before Christmas and one after, but in some instances a full year's course is provided. Facilities are also provided for short courses in special subjects and most of the institutes provide instruction for women, particularly in such subjects as dairying, horticulture and poultry-keeping.

The institutes are situated in the following counties:—

Cheshire (at Reaseheath, near Nantwich); *Cumberland and Westmorland* (at Newton Rigg, near Penrith); *Essex* (at Chelmsford); *Hampshire* (at Sparsholt, near Winchester); *Hertfordshire* (at Oaklands, near St. Albans); *Kent* (at Borden, near Sittingbourne); *Lancashire* (at Hutton, near Preston); *Lincolnshire*, Holland (at Kirton, near Boston); *Northamptonshire* (at Moulton, Northampton); *Somerset* (at Cannington, near Bridgwater); *Staffordshire* (at Rodbaston, Penkridge); *Suffolk* (Chadacre Agricultural Institute, Hartest, Bury St. Edmunds); *East Sussex* (at Plumpton); *Gaernarvonshire* (at Madryn Castle, Bodfean); *Carmarthenshire* (at Carmarthen); *Denbighshire* (at Ruthin); and *Monmouthshire* (at Usk, Newport).

A certain number of scholarships tenable at the institutes are awarded by County Councils to residents in their area, and the Ministry itself awards similar scholarships for the sons and daughters of agricultural workers.

Brief particulars of the courses for the session 1932-33 are contained in a leaflet (Form No. 732/T.E.) which can be obtained from the Ministry; more detailed information will be furnished by the Principal of the Institute concerned. Anyone desirous of attending one of the courses commencing in October should make immediate application to the Principal of the Institute concerned.

* * * * *

IN the fourth volume of this new series,* the weekly mean values of temperature, rainfall and sunshine, with deviations from normal, are given for the period

The Weekly Weather Report March 1, 1931, to February 27, 1932, for 57 stations well distributed over the British Isles. A single page shows the weekly values for the whole year for a single station; an arrangement which allows the general course of the weather at a particular place to be ascertained very quickly. Another table shows weekly and seasonal means of the same elements for each of the twelve districts into which the country is divided. It has been found necessary to substitute Kirkwall for Deerness, Renfrew for Kilmarnock and Newton Rigg for Aspatria, but, apart from this, the report closely resembles the report for the previous year.

* * * * *

PRICES of agricultural produce as a whole in August showed a further fall, the index figure being only 5 per cent. above the level of the base years 1911-13 as compared with 6 per cent. in July and 11 per cent. in June. At the corresponding period a year ago, prices averaged 21 per cent. above pre-war. The decline of one point in the index number was occasioned primarily by further reductions in the prices of fat sheep and potatoes, which were only partially offset by a few small increases.

In the following table are shown the percentage increases as compared with pre-war prices each month since January, 1927 :—

				<i>Percentage increase compared with the average of the corresponding month in 1911-13</i>					
<i>Month</i>				1927	1928	1929	1930	1931	1932
January	..	..	..	49	45	45	48	30	22
February	..	..	..	45	43	44	44	26	17
March ..	..	..	..	43	45	43	39	23	13
April ..	..	..	..	43	51	46	37	23	17
May ..	..	..	..	42	54	44	34	22	15
June ..	..	..	..	41	53	40	31	23	11
July ..	..	..	..	42	45	41	34	21	6
August ..	..	..	..	42	44	52	35	21	5
September	..	..	..	43	44	52	42	20	—
October ..	..	..	..	40	39	42	29	13	—
November	..	..	..	37	41	44	29	12	—
December	..	..	..	38	40	43	26	17	—

Grain.—Quotations for home-grown wheat were unchanged on average, but as a slight fall occurred at the corresponding

* *The Weekly Weather Report* (March 1, 1931—February 27, 1932). Vol. XLVIII. Pp. 72. (H.M. Stationery Office. Price 15s.)

period of 1911-13 the index number showed an increase of 1 point to 20 per cent. below pre-war. Barley and oats, however, declined in price by 3*d.* and 4*d.*, respectively, per cwt.; the index for oats advanced by 5 points to 6 per cent. above pre-war, but in the case of barley a drop of 4 points to 10 per cent. below 1911-13 was recorded.

Live Stock.—Values for fat cattle continued to recede, the average declining by 1*s.* 6*d.* per live cwt., but as a proportionately heavier decrease occurred in August of the base years, the index number was one point higher on the month at 18 per cent. in excess of 1911-13. A further sharp fall of $\frac{1}{2}$ *d.* per lb. was recorded in the price of fat sheep, and the index figure was 7 points lower at 10 per cent. below pre-war. As regards fat pigs, baconers showed an increase of 2*d.* per score lb. while the average for porkers advanced by 3*d.* per score; the index for baconers, however, fell by 1 point to 14 per cent. less than in 1911-13, but that for porkers was one point higher at 13 per cent. below pre-war. Dairy cows, store cattle and store sheep were cheaper in August than in July, but quotations for store pigs moved upwards to 14 per cent. below the level of the base years.

Dairy and Poultry Produce.—The contract price of milk again rose slightly at most centres and the index figure was 5 points higher on the month at 48 per cent. in excess of 1911-13. Butter also was slightly dearer, although the index fell by 4 points to precisely the pre-war level. The average price of cheese was lower at 25 per cent. above the base years. Egg prices continued to follow the upward course customary at this time of the year, and the index figure appreciated by 1 point to 15 per cent. above pre-war. The poultry index showed a decline of 2 points on the month.

Other Commodities.—The average selling price of first early potatoes in August was little more than half what it was in July, and the index figure was as much as 28 points lower at only 6 per cent. above the level prevailing in August, 1911-13. A year ago, potatoes were realizing 45 per cent. more than pre-war.

The index figure for hay showed a rise of 2 points to 32 per cent. below 1911-13, although quotations receded slightly. There was a further small recovery in wool prices in August, and the index appreciated by 3 points to 39 per cent. under pre-war. Prices of all descriptions of fruit during the month under review were much higher than a year earlier, apples showing an increase of about 30 per cent., cherries 70 per cent.,

black currants 80 per cent., red currants about 50 per cent. and plums and raspberries 40 per cent.

Index numbers of different commodities during recent months and in August, 1930 and 1931, are shown below :—

*Percentage Increase as compared with the Average
Prices ruling in the corresponding months of
1911-13.*

Commodity	1930	1931	1932			
	Aug.	Aug.	May	June	July	Aug.
Wheat	4	-21*	-23*	-20*	-21*	-20*
Barley	-12*	Nil	-7*	-7*	-6*	-10*
Oats	-13*	-8*	7	7	1	6
Fat cattle	37	29	20	18	17	18
„ sheep	62	38	7	7	-3*	-10*
Bacon pigs	41	-5*	3	-9*	-13*	-14*
Pork „	50	5	6	-9*	-14*	-13*
Dairy cows	35	25	18	16	12	10
Store cattle	30	31	15	15	13	13
„ sheep	66	40	-11*	-2*	-10*	-19*
„ pigs	112	32	Nil	-15*	-16*	-14*
Eggs	40	17	-3*	2	14	15
Poultry	43	31	36	32	19	17
Milk	58	55	37	37	43	48
Butter	33	10	8	-4*	4	Nil
Cheese	28	23	43	53	31	25
Potatoes	25	45	145	113	34	6
Hay	15	-12*	-30*	-31*	-34*	-32*
Wool	-5*	-31*	-33*	-43*	-42*	-39*

* Decrease.

* * * * *

FOLLOWING the precedent of previous years, the Rothamsted Experimental Station has arranged that Mr. H. V. Garner, the Guide-Demonstrator, and other mem-

Rothamsted members of the Staff shall be available,

Winter Lectures during the coming winter months, to give a few lectures on the Rothamsted

Experiments to Chambers of Agriculture and Horticulture, Farmers' Clubs, Farm Workers' Associations, Agricultural Societies, etc. The subjects for lectures, with the names of the respective lecturers, are given in the list following. From this a choice may be made, and the Station will endeavour to arrange for the selected lecture, or lectures, to be given on a date, or dates, convenient to the society concerned. Only one subject can be dealt with in a single lecture. No fee will be charged for a lecturer's services, but associations will be expected to defray travelling and hotel expenses, and to make all necessary arrangements for holding the lectures.

All communications regarding lectures, giving as much notice beforehand as possible, should be addressed to *The Secretary, Rothamsted Experimental Station, Harpenden, Herts.*

LECTURES BY MR. H. V. GARNER, M.A., B.Sc. (*Guide-Demonstrator*)

- (1) Modern practice in the use of manures.
- (2) The use of fertilizers on grass land.
- (3) Recent experiments with sugar-beet.
- (4) The manuring of potatoes.
- (5) The use of cheap nitrogen.
- (6) Some results of the Rothamsted Experiments on commercial farms.
- (7) Some practical aspects of the liming question.

OTHER LECTURES

- (1) *Soil Micro-Organisms (Bacteria, Protozoa, etc.)*

Lucerne Inoculation	Dr. H. G. Thornton, B.A.
Life in the Soil	
Biological Aspects of Partial Sterilization	Mr. D. W. Cutler, M.A.
- (2) *Agricultural Botany*

Weeds of Farm Land and Methods of Control	
Eradication of Farm Weeds by Spraying with Chemicals and Manures	Dr. Winifred E. Brechley, F.L.S.
- (3) *Agricultural Chemistry*

Liming and Chalking	
Recent Developments in the Production and Use of Fertilizers	Dr. E. M. Crowther, F.I.C.
Basic Slags and other Phosphatic Fertilizers	Dr. H. L. Richardson, M.Sc.
- (4) *Soil Physics*

Recent Developments in Soil Cultivation	Dr. B. A. Keen, F.Inst.P.
Soil Acidity: Its Cause and Control	Dr. R. K. Schofield, M.A.
- (5) *Entomology*

Insect Pests	Dr. H. F. Barnes, M.A.
Bee-Keeping	Mr. D. M. T. Morland, M.A.
- (6) *Mycology*

Virus Diseases of Plants	Dr. J. Henderson Smith, M.B.
	Dr. J. Caldwell, B.Sc.
Plant Diseases: their Causes and Control	
Bacterial Diseases of Crops	Mr. R. H. Stoughton, B.Sc.

* * * * *

ESTIMATES of the probable yield of cider apples in England and Wales furnished by Inspectors of the Ministry of Agriculture and Fisheries indicate that the yield

Cider Fruit on the whole is unlikely to show any
Crop Estimate improvement on that of last year.

The following table shows the index figure for each of the principal districts, together with the

corresponding figure for 1931. The scale on which the index figures are based is as follows: 25 or under = very bad; 26-35 = bad; 36-45 = poor; 46-55 = fair; 56-65 = very fair; 66-75 = good; over 75 = very good.

	1932	1931
Devon	23	26
Dorset	35	30
Gloucester, West	15	5
Hereford	20	15
Monmouth	10	15
Somerset	28	40
Worcester, West	15	10
Worcester (Worcester and Droitwich area)	15	26
* * *		

Foot-and-Mouth Disease.—Since the notification published in the last (September) issue of this JOURNAL, four outbreaks of foot-and-mouth disease have occurred, in the parishes of Salcombe and Malborough, Devonshire. These outbreaks were confirmed on September 4, 5, 6 and 16, respectively. The usual restrictions on the movement of cattle, sheep, goats, pigs and deer within a distance of approximately 15 miles of the infected premises were imposed.

* * *

Enforcement of Minimum Rates of Wages.—During the month ending September 14, legal proceedings were instituted against three employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County	Court	Fines imposed	Costs allowed	Arrears of wages ordered	No. of workers involved
		£ s. d.	£ s. d.	£ s. d.	
Yorks, W.R.	Halifax ..	4 0 0	0 7 6	115 0 0	2
Yorks, W.R.	Wakefield	1 0 0	0 5 6	7 16 2	1
Yorks, W.R.	Wetherby	2 0 0	—	55 0 0	2
		£7 0 0	£0 13 0	£177 16 2	5

* * *

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS ENGLAND

Cheshire: Mr. H. Fairbank, N.D.H., has been appointed Horticultural Superintendent, *vice* Mr. W. E. Shewell-Cooper.

Mr. L. F. Clift, N.D.H., C.D.H., has been appointed Assistant-Lecturer in Horticulture, *vice* Mr. H. Fairbank.

Staffordshire: Mr. L. H. Hughes has been appointed Manager of the County Egg-Laying Trials, *vice* Mr. J. Cooke.

Yorkshire: Mr. A. B. Turnbull, B.Sc.(Agric.), has been appointed Temporary Research Assistant in Agricultural Economics, *vice* Mr. D. Witney, Assistant Lecturer in that subject.

NOTICES OF BOOKS

History and Theory of Agricultural Credit in the United States. By E. S. Sparks. Pp. xiii+476. (New York: Thomas Y. Crowell Co. Price \$3.75.)

This volume gives a comprehensive survey of the many-sided system of agricultural credit in the United States of America. Sections are devoted to long and short term credit, and the credit activities of the Federal Farm Board, and of the Credit Corporations established by it, are also reviewed. Apart from the large amount of useful information that it contains, the book is valuable on account of its critical standpoint. For example, doubt is expressed as to the ultimate benefits to agriculture of long-term credit at cheap rates, seeing that this has tended to inflate prices for farmland. Similarly, it is suggested that short-term credit would be in a healthier position if it were liberated from Government subsidies. The broad conclusion is that the provision of credit offers no panacea for agricultural ills, and that there is much scope for the more scientific use of the credit given. Side by side with this, research is needed in the problems of production technique and control, and also in marketing, in order that credit assistance to agriculture may play its proper part.

Index to the Literature of Food Investigation. Vol. IV, No. 1. Compiled by A. E. Glennie, B.Sc. Pp. iv+135. Department of Scientific and Industrial Research. (London: H.M. Stationery Office. 1932. Price 2s. 6d.)

This is another of the bibliographies that the Department of Scientific and Industrial Research issues twice a year with the object of keeping the research institutions of the Empire in touch with the progress that is being made in regard to the preservation and transport of food. The provision of such lists should prove valuable to research workers whose time or facilities for consulting current literature on these important subjects may be limited, as by this means they obtain information of any published literature bearing on the particular lines of investigation in which they are interested. Like its predecessors, the present issue contains a summary of the more noteworthy developments of the previous twelve months, and a brief description of each publication is included in the index.

Methods of Analysing Fertilizers (*Die Analysenmethoden der Düngemittel*). By Dr. A. Suchier. Pp. 79. Illus. (Berlin: Verlag Chemie, G.M.B.H. Price 6RM.)

Apart from the official methods of fertilizer analysis laid down in the Fertilizers and Feeding Stuffs Regulations, and a brief section in the "Methods of Analysis" of the Association of Official Agricultural Chemists in America, information about the analysis of fertilizers is scattered and difficult to obtain. Modifications in standard methods may be desirable for special types of fertilizer, while the newer materials such as Rhenania phosphate and Nitrophoska (or other concentrated compound manures) invite special treatment. The booklet under review is valuable because it covers a wide range of fertilizer materials, including those newer ones mentioned; the methods given are based on years of practical experience, sometimes—as in phosphate determinations—accompanied by a considerable amount of investigation into alternative techniques; and the descriptions are sufficiently full to enable a method to be easily standardised. At the end there is a good assortment of recipes for solutions, and of tables of analytical factors. There is also a useful series of average

analyses covering most of the fertilizers or raw materials for fertilizer manufacture likely to be met with in practice; in mixed manures, as is natural, German examples are given. Here and in the body of the book phosphates have received special attention.

Hop Growing and Hop Curing from the Fire Insurance Viewpoint. By M. Butler, F.C.I.I. Pp. viii+75, and 35 figs. (London: Tudor Press, Ltd. 1932. Price 1s. 6d.)

This booklet contains a very readable account of the processes of hop production from the earliest times, with special reference to problems of fire insurance. The developments that have taken place in the drying plant are related in a manner that may interest many besides those who are directly concerned in the industry. Various types of oasts are described and illustrated, from the familiar charcoal-heated houses with conical roofs to the latest design of a building fitted with electrically-driven fans.

Chromosomes and Plant-Breeding. By C. D. Darlington, Ph.D., D.Sc. Introduction by Sir Daniel Hall, K.C.B., F.R.S. Pp. 112, 25 figs. (London: Macmillan and Co., Ltd. 1932. Price 7s. 6d.)

This book is based on a series of articles that appeared in periodical form some two years ago. They were intended originally for the horticulturist, but the present volume has enlarged their scope, and aims at demonstrating the importance of the subject to botanists in general. The rapid development in the study of chromosomes during recent years has been connected in no small measure with the work of the John Innes Horticultural Institution, at which the author is cytologist. As Sir Daniel Hall, the Director of the Institution, points out in a Foreword: "The records of investigation are scattered through so many periodicals that all students may well be grateful to have the records of recent research gathered together and presented as a whole." The practical value of this research may not be always apparent at first sight, and it is true that chromosome studies do not give the plant-breeder any greater control over his material, but they will enable him to direct his efforts into the right channels for obtaining and preserving results likely to prove most profitable. Dr. Darlington writes in an easy comprehensible style, and his illustrations are well chosen. In a future edition it would be an improvement if a brief glossary could be added for the benefit of non-scientific readers.

The Cold-Storage of English Plums. By Franklin Kidd and Cyril West. Pp. 6. **The Preservation of Fruit and Vegetables by Freezing.** By J. Barker and T. Morris. Pp. 9. (London: Department of Scientific and Industrial Research, 16 Old Queen Street, Westminster, London, S.W.1. 1932. Gratis on application.)

These are the first two of a series of brief pamphlets, dealing with practical problems connected with the storage of foodstuffs, that are being issued by the Food Investigation organization of the Department of Scientific and Industrial Research. The first is concerned with the technical problems of storing plums. It contains tables showing:—

- (a) the inter-relation between the effects on the length of storage life of the plums of (1) the degree of maturity of the fruit on gathering, e.g., less ripe, normal, or more ripe, and of (2) the temperature of storage, e.g., 34°F., 40°F., or 55°F.;
- (b) the effect of the strig on wastage of Victoria plums in store;
- (c) the effect of rain before picking on the storage-life of plums.

In addition to a discussion of the best temperature to be employed and the need of varying it according to the ripeness of the fruit, the pamphlet gives useful notes on the proper condition of the fruit when

put into store, e.g., dryness, the type of package, and the type of store to be used.

The second pamphlet draws attention to the fact that the commercial preservation of fruit by freezing has made considerable progress in the U.S.A. in the last 10 years, though little used as yet in Great Britain. It points out that freezing without other treatment has been successfully used for certain fruits, but that in others discoloration and loss of flavour occur. It discusses various methods that have been adopted to overcome this disadvantage—freezing with sugar or syrup, blanching before freezing, freezing and storing in a vacuum or under an inert gas, and quick freezing. Frozen products may be used for direct consumption, raw or cooked, canning or jam-making, but different methods must be adopted for each class of product. The pamphlet describes the different treatments necessary, the temperatures of freezing, storing, and thawing, and other practical details involved.

Report on the Work of the Harper Adams College Pig-Feeding Experimental Station, 1926-1931. By Dr. C. Crowther. Pp. 44.

(Obtainable on application to the Harper Adams Agricultural College, Newport, Salop. Price 1s., post free.)

This report, which has already appeared in the *Journal of the Royal Agricultural Society*, contains the results of a number of investigations of practical problems in pig-feeding undertaken by the Harper Adams Agricultural College during the past five years. The experiments carried out show that a ration of cereal meals is deficient in proteins and certain minerals essential to a rapidly growing pig, but that extracted soya meal, supplemented with limestone and salt, will when added to a cereal ration give as good results as fish meal. The feeding value of tapioca flour, dried sugar-beet pulp, degermed maize and potatoes has been the subject of experiments and is also discussed in the report. The investigations included inquiries into the economic value of milk, both whole and separated, in pig feeding, and into the water requirements of the sty-fed pig. A table is given showing the average live weight of pigs of Large White type recorded at the Station from 1 week to 32 weeks old. The report thus contains, in addition to the results of the experiments undertaken, a great deal of information on the rations of pigs and on their rate of growth under different conditions.

Modern Farm Buildings. By D. N. McHardy, N.D.A. Pp. xi+227. Figs. 85. (London: Crosby Lockwood & Son. Price 8s. 6d.)

Books about building for farm purposes are uncommon, probably because, under present conditions, farm buildings are erected only under the compulsion of necessity. The present work, which is, in effect, a book on building construction related to farm needs, makes a quite useful addition, bringing within one small volume a general survey of its subject and much information as to sizes of farm implements and quantities of building materials required for specified jobs that otherwise would involve some trouble to procure. There is still room for a manual on the planning of farm buildings, to bring up to modern standards the relationship that should exist between the various in-and-out circulations on modern factory lines and economise, as far as may be, useless journeyings and annoying cross-traffic. This subject is but lightly touched upon by the author, and as his illustrations (apart from those that are drawn from trade lists) are poor, he perhaps jibs at the task. There are a number of points throughout the book upon which information given is incomplete or misleading. For example, plans, if drawn on reasonably thin paper, need not be specially traced for process copying, which latter may also give black lines on white paper and is not restricted to blue-prints. While it is vital that any

concrete-work should be kept moist during the "curing" process it is equally vital to avoid excess of water in mixing. That and the process of floating to bring the cement to the surface (p. 14) alike result in a friable surface subject to "dusting." Among possible underlinings to roofs of slate, asbestos-cement, or galvanized iron it might have been well to mention felt on wire netting and the newer "untearable" felt, which is a thin bituminous roofing made on a basis of tough Hessian. In fixing corrugated asbestos, nailholes should be drilled before driving the nails. The lesser condensation on this form of roofing is due more to its rougher surface and slight absorbency as compared with galvanized iron than to marked superiority in insulating qualities, though the reflecting properties of its whitish upper side render it definitely cooler under hot sunlight than old (and especially tarred) galvanized iron. Paint on new galvanized iron should be deferred until it has "weathered" at least a year. Against the advantages of sliding doors, it might be mentioned that their necessary clearance makes them draughty. The drainage manhole shown in Fig. 35 is not according to the best principles; the side branch (if any solids are conveyed) should rest on the main channel and be submerged in steeper cement benching. The form shown might do for rainwater.

On the important matter of cowshed design, the author's advice seems, in several respects, at variance with the most approved experience. For instance, as regards the gutter or manure channel, it is recommended that this should be 5 in. deep and 14 in. to 18 in. wide, which is not in accordance with the most modern practice. It is further explained that whatever arrangement is chosen the fall of the gutter should leave its depth unaltered, which involves setting out the cowhouse floor to the same inclination. Big knees is attributed by many to cows striking the edge of the concrete manger when settling rather than to concrete as a floor; and as to the question of coldness, the conductivity of concrete cowbeds can be much lowered by reduction of thickness and making up beneath on layers of coarse open rubble or brick rubbish, or even hollow-brick partition slabs.

In stables the wear occasioned by stamping can be lessened by the insertion of blue-brick "heel-panels" without going to the expense of a complete floor, and if the concrete surface is *not* floated as recommended elsewhere, but treated with a silicate or iron oxide hardener, it will stand up pretty well. There is no mention of the purpose and uses of a chaffhouse or "cuthouse," which is usual in some parts of the country.

The chapter on repairs is a useful one, but caution is necessary as to pointing old brickwork in cement, which is apt to provoke decay of the bricks.

The section on simple specifications should be helpful, but it might be well to emphasize the necessity that in cavity-wall construction the cavity should extend through the damp course and at least 6 in. below, and that the top of the wall should be built over solid from the level of the eaves; neglect of these two points is very common.

The Botany of Crop Plants. By W. W. Robins. Third edition, revised. Pp. x+639. 269 illus. (Philadelphia: P. Blakiston's Son & Co., Inc., 1012 Walnut Street. Price \$4.)

This volume, intended for a textbook and manual of reference for schools and colleges in the United States, has been developed from a series of lectures delivered by the author at the College of Agriculture in the University of California. In its preparation, due attention has been paid to the practice in American schools of drawing on economic material for examples and study wherever botany is taught.

Part I consists of introductory notes designed to refresh the reader's knowledge of fundamental principles and prepare him for Part II.

This second part deals with the general, agricultural and horticultural botany of the chief crop plants of the United States, which include also the principal crops of European agriculture and horticulture, as well as numerous sub-tropical crops. The book, therefore, covers a wide field and is suitable for use not only in this country but also in the Dominions and Colonies.

As regards dicotyledonous plants, a separate chapter is devoted to the crop plants of a single family, while three chapters are given to what, in European nomenclature, is generally known as the family Rosaceae. There are chapters on the "tribes" Pomaceae and Drupaceae respectively; and for grasses, there is an introductory chapter dealing with the subject generally, followed by separate chapters on each of the important genera, with a further chapter on miscellaneous small millets. The scope of the work may be deduced from the fact that rice and sugarcane are among the crops discussed.

The subject matter and the arrangement of the chapters are excellent. Each crop plant is dealt with separately and its morphological characters are described with special reference to their cultural significance; and methods of pollination, commercial uses, varieties and strains, and historical and geographical distribution follow. Where necessary, keys are given to enable the reader to distinguish genera and species.

The illustrations, mainly from line drawings, though supplemented by photographic views where convenient, have the parts to which particular attention is drawn distinctly labelled. Each chapter concludes with a bibliography concerning the crops dealt with, and, at the end of the volume, there is a glossary of botanical terms. As the title denotes, the work is confined to crop plants, and does not deal, therefore, to any large extent with permanent pasture and herbage plants, to which so much space is frequently allotted in textbooks of agricultural botany that are written in this country. It is a work that can be recommended as a textbook and manual of reference; and the author's acknowledgments to other workers, who have assisted with information on crop plants on which they have specialized, indicates its authoritative nature.

A Course of Practical Work in Agricultural Chemistry for Senior Students.

By T. B. Wood. Second edition, revised by H. H. Nicholson.

Pp. 56. (London: Cambridge University Press. Price 2s. 6d.)

This brochure was compiled by the late Professor of Agriculture at Cambridge for use in teaching a class of senior students in Agricultural Chemistry. The present revision incorporates the most recent developments in this branch of study, including new methods of mechanical analysis, the determination of the sticky point in a soil, the estimation of nitrates in soils and fertilizers, and the examination of the calcium status of soils (reaction and exchangeable CaO). A manual of this practical character cannot fail to be useful to teachers of advanced classes on the subject.

The Rex Breeds of Rabbit. Pp. 75. Illus. (Idle: Watmoughs Ltd. 1932. 1s. 6d.)

This brochure deals with a new type of rabbit for fur, and contains contributions by about a dozen writers, each of whom is a well-known breeder, exhibitor or investigator. The rex-coated rabbit is remarkable for a pelt in which the long guard hairs are shrunken and in many cases appear to be absent from the skin, thus producing a plush or mole-like appearance. This rex-coat character behaves as a simple Mendelian recessive to the normal coat character. A brief account of the factors involved and the procedure in "making" certain coloured and white rexes is contributed by Mr. E. C. Richardson and Dr. J. N. Pickard. Practical breeders have written the separate chapters

describing the accepted varieties at present exhibited at British shows, and standards of excellence are appended. Captain W. Brumwell summarizes the history of the rex rabbit, relating how it was first discovered among the stock of a French peasant who brought it to the notice of the Abbé Gillet. The latter became interested and exhibited it at the Paris International Show in 1924. The first Castorrex to be exhibited in this country was penned at the Leicester Show of November, 1927. A separate rex mutation has also occurred in Germany. The chapters on housing and feeding are of unusual interest, the contributor, Captain Slaughter, giving specifications and details of procedure based on his own experience in building up a rabbitry of more than 5,000 rabbits.

Utilisation des Fruits. By H. Babet-Charton. Pp. 232, 83 figs. (Paris: Librairie Agricole de la Maison Rustique, 26 rue Jacob, VIe. Price 13f. 20c.)

Mme Babet-Charton is already well known to agriculturists, horticulturists, housewives and others as the author of a number of useful manuals. In this brochure she aims at providing a solution of the problem created by the fact that most French (and British) fruits arrive round about the same season of the year. In twenty-three chapters she describes the most effective methods of dealing with the surplus products of orchards and gardens, detailing over 400 practical recipes drawn from various sources, ancient and modern. The text is assisted by illustrations of a helpful character, and there is a useful appendix containing a calendar of fruits.

* * * * *

ADDITIONS TO THE LIBRARY

Plant Pests and Remedies

United States Department of Agriculture.—Misc. Publication No. 120: A Digest of the Literature of Derris (*Deguelia*) Species used as Insecticides, 1747-1931. (86 pp.) Washington, 1932. [63.295.]

Live Stock and Feeding

Hammond, J.—Growth and the Development of Mutton Qualities in the Sheep. A Survey of the Problems involved in Meat Production. (Contains a section written in conjunction with A. B. Appleton.) (xxvi + 597 pp. + pl.) Edinburgh and London: Oliver & Boyd. (Biological Monographs and Manuals.) 1932. 42s. [575; 612; 63.631.]

Rothamsted Experimental Station, Harpenden.—The Place and Management of Sheep in Modern Farming; being the Report of a Conference held at Rothamsted on March 24, 1931, under the Chairmanship of J. Egerton Quesset, with contributions by F. A. Thomson and others. (66 pp.) Harpenden, 1931. 1s. 6d. (Rothamsted Conference XII.) [63.631.]

University of Leeds and the Yorkshire Council for Agricultural Education.—No. 171: Experiments on the Fattening of Sheep on Roots at Askham Bryan, York, during the Winters of 1929-30 and 1930-31. (12 pp.) Leeds, 1931. [63.631: 043.]

Harper Adams Agricultural College.—Pig Feeding Report No. 1: The Work of the Harper Adams College Pig Feeding Experimental Station, 1926-31. (Reprinted from Jour. Roy. Agric. Soc. Eng., Vol. 92, 1932.) (pp. 1-62.) Newport, 1932. 1s. [612.394, 63.64: 043.]

Ritter, K.—Die Schweinehaltung der Welt und der Handel mit ihren Erzeugnissen. (Berichte über Landwirtschaft, Neue Folge, 41 Sonderheft.) (266 pp.) Berlin: Parey, 1931. RM. 27.50. [63.64.]

- The Rex Breeds of Rabbit. (iv + 75 pp. + 6 pl.) Idle, Bradford and London : Watmoughs, 1932. 1s. 6d. [63.69.]
- Macnaghten, L.—Pistol versus Poleaxe. A Handbook on Humane Slaughter. (xxv + 577 pp.) London : Chapman & Hall, 1932. 21s. [614.97.]

Dairying

- University of Manchester (Agricultural Economics Department).*—Economy in Feeding for Milk Production, by J. Orr. (10 pp.) Manchester at the University Press, 1932. 6d. [338.1 (42); 63.711 : 043; 63.714.]
- University of Reading, Faculty of Agriculture and Horticulture.*—Bulletin No. XLIV : History of the Reading University Herd of Dairy Shorthorn Cattle, 1908-1930, by S. Pennington and K. W. D. Campbell. (62 pp.) Reading, 1932. [63.711.]
- University of Oxford, Agricultural Economics Research Institute.*—Problems of Milk Distribution, by F. J. Prewett. (31 pp.) Oxford at the Clarendon Press, 1932. 1s. [63.716.]
- Empire Marketing Board.*—E.M.B. 52 : Dairy Produce Supplies in 1931. (116 pp.) London : H.M. Stationery Office, 1932. 1s. [63.7.]
- Empire Marketing Board.*—E.M.B./C./1 : Dairy Produce. A Summary of Figures of Production and Trade Relating to Butter, Cheese, Preserved Milk, Eggs, Egg Products. (32 pp.) London : H.M. Stationery Office, 1932. 6d. [63.7.]
- United States Department of Agriculture.*—Misc. Publication No. 138 : Refrigeration in the Handling, Processing and Storing of Milk and Milk Products. (59 pp.) Washington, 1932. (63.713; 63.717.)
- Hannah Dairy Research Institute.*—Bulletin No. 3 : The Properties of Milk in Relation to the Condensing and Drying of Whole Milk, Separated Milk and Whey. A Review of Existing Knowledge, by L. A. Allen. (vii + 159 pp.) Ayr, 1932. 4s. 6d. [63.715.]
- Empire Marketing Board.*—E.M.B. 48 : Further Changes in the Demand for Butter, July, 1928, and July, 1931. Report of an Investigation into the Retail Marketing of Butter in Nottingham. (21 pp.) London : H.M. Stationery Office, 1932. 1s. [63.724.]
- United States Department of Agriculture.*—Bulletin No. 608 : Varieties of Cheese : Descriptions and Analyses. (68 pp.) Washington, Revised, 1932. [63.736.]
- Leitch, R. H.—Cheddar Cheesemaking and Faults in Cheese. (77 pp.) Glasgow : Scottish Agricultural Publishing Co., 1932. 2s. [63.73; 63.736.]
- Babel-Chorton, H.—De bons fromages par tout et partout. (93 pp.) Paris : Librairie Agricole de la Maison Rustique, 1931. 6 Fr. [63.73.]
- Iowa Agricultural Experiment Station.*—Research Bulletin No. 144 : Chemistry of Butter and Butter Making. I. A Comparison of Four Methods for the Analysis of Butter, with an Explanation of a Discrepancy Found to Exist in the Fat Determinations. (pp. 356-382.) Ames, 1931. [543.2.]
- Iowa Agricultural Experiment Station.*—Research Bulletin No. 145 : Bacteriology of Butter. IV. Bacteriological Studies on Surface Taint Butter. (pp. 387-416.) Ames, 1931. [576.8 : 7.]

Meat and Wool

- Department of Scientific and Industrial Research.*—Food Investigation Special Report No. 42 : The Yellowing of the Abdominal Fat of Frozen Rabbits, by J. R. Vickery. (iv + 27 pp.) London : H.M. Stationery Office, 1932. 6d. [664.8; 664.91.]

Aberystwyth, University College of Wales.—Department of Agricultural Economics. Partial Protection of the Fresh Pork Market. A Study of the Effects of the Meat Imports (Prohibition) Order, 1926, by *R. Henderson*. (46 pp. mimeograph.) Aberystwyth, 1932. [63.75; 63.752.]

Line, E. O.—The Science of Meat and Biology of Food Animals. Vol. I. (xii + 576 pp.) London: Meat Trades' Journal, 1931. 10s. [575; 612; 614.31; 63.751.]

Nichols, J. E.—A Study of Empire Wool Production. Being a Survey of Conditions in New Zealand, Australia, South Africa, Southern Rhodesia, Kenya, Canada, Irish Free State, etc. (148 pp. + 15 pl.) Torridon, Headingley, Leeds: Wool Industries Research Association, 1932. 5s. [63.631; 63.761.]

Veterinary Science

Isle of Man Board of Agriculture.—Bulletin No. 3: The Ox Warble Fly. The New Polvo Powder Treatment. (3 pp.) Peel, 1932. [619.2.]

United States Department of Agriculture.—Misc. Publication No. 66: Economic Benefits of Eradicating Tuberculosis from Live Stock. (23 pp.) Washington, Revised, 1932. [614.54.]

People's League of Health.—Report of a Special Committee appointed by the League to make a Survey of Tuberculosis of Bovine Origin in Great Britain. (xvii + 44 pp.) London, 1932. 1s. 6d. [614.54.]

Bee-keeping and Honey

Wedmore, E. B.—A Manual of Beekeeping for English-speaking Beekeepers. (413 pp.) London: Edward Arnold, 1932. 15s.

Irish Free State Department of Agriculture.—Instruction in Bee-Keeping for the use of Irish Bee-Keepers. (New and Revised Edition.) (88 pp. + pl.) Dublin: Stationery Office, 1931. 1s. 6d.

Empire Marketing Board.—E.M.B. 50: The Demand for Honey. (67 pp.) London: H.M. Stationery Office, 1932. 1s. [63.77.]

Fruit and Vegetable Preservation

University of Bristol Research Station, Campden.—Misc. Publication No. 1: Preliminary Report on a Rapid Method of Bottling Fruits, by *F. Hirst* and *W. B. Adam*. (12 pp.) Campden, 1932. [664.85.]

University of Bristol Research Station, Campden.—Canners' Bulletin No. 2 (Revised): The Use of Sugar Syrups in Fruit Canning, by *F. Hirst* and *W. B. Adam*. (19 pp.) Campden, 1932. [664.8; 664.85.]

University of Bristol Research Station, Campden.—Canners' Bulletin No. 4: The Factory Inspection of Canned Fruits, by *F. Hirst* and *W. B. Adam*. (39 pp.) Campden, 1932. [664.8; 664.85.]

University of Bristol Research Station, Campden.—Canners' Bulletin No. 5: The Canning of Green Peas, by *F. Hirst* and *W. B. Adam*. (43 pp.) Campden, 1932. [664.8; 664.84.]

Department of Scientific and Industrial Research.—Food Investigation Leaflet No. 1: The Cold Storage of English Plums, by *F. Kidd* and *O. West*. (6 pp.) London, 1932. [664.8.]

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THE JOURNAL OF THE MINISTRY OF AGRICULTURE

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NOTES FOR THE MONTH

SEVERAL inquiries have reached the Ministry recently as to the correct method of marking tomatoes from Guernsey and Jersey, on importation into this country, and on exposure for sale in shops, and on Channel Islands and on hawkers' barrows. Most of these appear to have arisen out of prosecutions that had been instituted by local authorities, and it seems probable that the abbreviated reports of proceedings that have found their way into the Press may have been responsible for some misunderstanding. In some instances the impression has been gained—quite erroneously, of course—that the convictions recorded amounted to decisions on the part of the magistrates that the Channel Islands are not “British.”

The position is, briefly, that an Order in Council has been made under the Merchandise Marks Act, 1926, requiring all imported tomatoes to bear an indication of origin on importation, and also at subsequent stages, including that of “exposure for sale by retail.” The expression “indication of origin” is defined in the Act of 1926 as meaning either the word “Empire,” or the word “Foreign,” as the case may require, or alternatively an indication of the country in which the goods were manufactured or produced. When tomatoes are imported, this indication must appear on each outer container, or on a label attached to the container, in letters not less than $\frac{1}{4}$ -inch high; but when they are exposed for sale in a shop or on a barrow, marking must be by means of a show ticket, clearly visible to intending purchasers, bearing the indication in letters again not less than $\frac{1}{4}$ -inch high. It is, therefore, apparent that both exporters in the Channel Islands, and retailers in this country, will be carrying out their obligations if they use either the word “Empire” or some definite indication, such as “Guernsey Produce” or “Grown in Jersey,” as the case may be.

In some instances, containers of Channel Islands tomatoes are marked “British Produce—Grown in Sunny Guernsey (or Jersey).” While the Ministry has no power to express an

authoritative interpretation of an Act of Parliament, the view it has taken and the opinion it has expressed to those local authorities who have sought advice is that no objection can be taken under the Act to the use of the term "British" in connection with Channel Islands produce, provided that the indication of origin required in accordance with the Marking Order is also given.

As far as the Ministry is aware, there has been no instance in which a conviction has been recorded for marking Channel Islands produce as "British." The convictions have been for failing to mark the produce with the indication of origin required by the Order. The point that retailers should bear in mind is that tomatoes from the Channel Islands must bear the indication of origin—"Empire," or words which show their country of production—in $\frac{1}{4}$ -inch letters on a show ticket; but provided they do this, there is no objection, in the Ministry's view, to the addition of words to the effect that the tomatoes are British produce.

* * * * *

THE importance of the use, by breeders of dairy cattle, of bulls which have been proved to produce stock of good milking propensity is now receiving more attention from breeders, and a Dairy Bull Testing Association has been formed in Cumberland and Westmorland in order to assist in this direction. The objects of the Association are as follows:—

**Cumberland and
Westmorland
Dairy Bull-Testing
Association**

- (1) To take such steps as may be considered expedient to obtain data in regard to the milk yields, etc., of the daughters of dairy bulls used in the Milk-Recorded Herds in Cumberland and Westmorland and elsewhere.
- (2) To keep a register of such bulls which may come up to the desired standard as regards improvement in milk yields, conformation of udder, etc., of their progeny.
- (3) To take the necessary steps to advertise any such bulls among the breeders of dairy cattle in the country, and to offer such breeders all facilities to obtain any desired information when selecting a bull.
- (4) To keep a register of proven bulls, and of others which will be "on test" (although not yet proven), for the purposes of facilitating the exchange or sale of older bulls.

The Register of Bulls is to be divided into three Sections, viz. :—

A. *Proven Bulls* whose daughters have improved on the yields of their dams, or which have maintained yields of a sufficiently high standard, and which have been inspected and passed as satisfactory by the Inspection Committee.

B. *Proven Bulls* whose daughters have improved on the yields of their dams, or which have maintained yields of a sufficiently high standard, but which have not been inspected.

C. Bulls "on test" (not proven), which are offered for sale or exchange.

Before a bull will be definitely accepted for entry in Section A of the register, his progeny are to be inspected by at least two members of the Committee and passed as suitable as regards type, conformation, shape of udder, etc. A bull will not be eligible for entry in Section A or B of the register unless particulars of the yields of at least four of his daughters over at least one complete lactation period are available for comparison with the yields of their dams.

The Association hopes that the provision of definite data regarding dairy bulls which have produced good milking stock will lead to a demand for proved bulls and also for young animals sired by these bulls.

Dairy farmers in Cumberland and Westmorland and the adjoining counties are eligible for membership of this Association, the Secretary of which is Mr. F. A. Capstick, Bridge House, Old Hutton, Kendal. The annual subscription is 5s.

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THE following has been communicated by Miss D. M. Turner, B.Sc., and Mr. D. H. Findlay, B.Sc., N.D.A., N.D.D.,
Department of Agriculture, University

Grey Leaf of of Leeds :—

Oats

The Grey Leaf disease of oats, which occurs in many parts of the country, is becoming so serious in certain districts of Yorkshire that the oat crop cannot successfully be grown in them. The disease is believed to be due not to parasitic agency but to physiological disturbances in the plant, and is considered to be identical with a similar oat trouble reported from Australia, America and the Continent, in which countries it has been found to be controllable by applying manganese salts to the soil. An extensive series of trials has been made in Yorkshire to determine whether similar treatment would be successful under English conditions. The results, however, have been very disappointing and, in view of the high cost of dressings, it seems advisable to publish a brief account of the trials.

Grey Leaf is recognizable by the appearance on the fourth and subsequent leaves of greyish-green spots, which eventually become yellow and shrivelled, and may coalesce into long streaks or blotches. In severe cases the leaf bends at the middle of the blade, becomes limp and hangs down—a typical feature. Affected plants may grow out of the disease, especially in a wet season, but more frequently they remain yellow and stunted, or die outright. Outbreaks of Grey Leaf generally occur in patches in a field, and the entire crop on

such patches is frequently destroyed. The trouble tends to appear on the lighter types of soil, although it is by no means confined to them, and it is definitely aggravated by an increase in the lime content of the soil.

In most experimental work on Grey Leaf the best remedial results have been obtained with manganese sulphate. In Holland a dose of 45 lb. of this chemical per acre is claimed to give complete control. Certain German workers advocate double this quantity, and, in experiments recently described in the *Welsh Journal of Agriculture*, 3 to 4 cwt. per acre have been applied with successful results. Cost is a factor of primary importance, and as the price of manganese sulphate ranges from 30s. to 40s. per cwt. heavy dressings are not an economic proposition; for this reason the trials made in Yorkshire have not included dressings above 45 lb. per acre.

In 1930, plots were laid down at five centres and included applications of manganese sulphate, at the rates of 15, 30 and 45 lb. per acre, of the cheaper manganese dioxide at 9, 18, and 27 lb. per acre, and also of sulphate of ammonia and nitro-chalk, the two latter substances being included because of a widespread opinion that they check the disease. No satisfactory results were obtained from any of the treatments applied at sowing time, but some slight improvement was recorded when manganese sulphate at the rate of 45 lb. per acre was applied at the first appearance of Grey Leaf; this improvement, however, was not sufficient to justify the cost of the dressing.

In 1931 certain modifications were made. Potassium permanganate replaced manganese dioxide, sulphate of ammonia was excluded and nitro-chalk was included at one centre only. The manganese salts were applied at the rate of 15 and 45 lb. per acre, and to facilitate distribution were sprayed on in solution. In 1930 there appeared to be a decrease in the amount of Grey Leaf on the headlands, hence additional rollings, alone, and with a 15-lb. dressing of manganese sulphate, were included, to ascertain whether consolidation would control the disease. The plots that received manganese salts confirmed the 1930 results, namely, that whilst some improvement was obtained from 45 lb. of manganese sulphate applied *after* the disease appeared, this rate of dressing was not curative for Grey Leaf in Yorkshire. Consolidation gave no tangible improvement; moreover, on some soils it definitely checked germination. The plot receiving nitro-chalk, however, recovered rapidly, and

appeared to confirm the local opinion of the beneficial action of this fertilizer.

In view of the inferior results obtained from the use of manganese salts in 1930 and 1931, no further dressings of them were applied in 1932, but attention was directed to the effect of nitrogenous manures upon the incidence of the disease. Sulphate of ammonia, nitro-chalk, and nitrate of ammonia, at rates equivalent to 1 cwt. of sulphate of ammonia per acre, were given, both at sowing time and when the disease appeared. These treatments produced no improvement over the untreated plots, and it is felt that no reliance can be placed upon the apparently favourable result obtained from nitro-chalk in 1931.

The position would, therefore, appear to be that dressings of manganese sulphate at the rate of 45 lb. per acre (the Continental recommendation) do not prevent Grey Leaf in Yorkshire, and that any higher rate cannot, on the grounds of cost, be considered as a practical proposition. Additional nitrogenous manures have had no curative effect upon badly-diseased plants, and with them there is the danger of "lodging" with the healthy part of the crop. Variety trials at Aberystwyth have shown that there are varying degrees of susceptibility to Grey Leaf among the Welsh varieties, but little is known of the oats generally grown in England and Scotland in this regard. In a series of trials carried out in 1932 the authors found that Golden Ram showed a marked susceptibility and Record some measure of resistance, Marvellous and Supreme following closely behind. It is possible, therefore, that investigations upon these lines may lead to more fruitful results than soil treatment with highly-priced manganese salts.

Acknowledgments are due to Major Dent, Ribston Hall, Wetherby; Mr. E. Parke, Crayke Hall, Yedingham; Mr. Henry Stephenson, Newstead Grange, Yedingham; and Mr. W. Wood, Grimston, Gilling, York, for the very generous help which they have given in carrying out these trials.

* * * * *

THERE is no agreement as to what crops are covered by the terms "salads," but by common consent are included lettuce, endive, chicory, dandelion, corn salad, watercress, radish, and mustard and cress, all of which are dealt with in a Bulletin*

Salad Crops

recently published by the Ministry.

* Bulletin No. 55, *Salad Crops*, obtainable through a bookseller or from H.M. Stationery Office. Price 1s. 6d. (post free 1s. 9d.).

Salad crops differ from many others in that they are required for consumption, not only at one season, but throughout the year. Their production at out-of-season times requires special knowledge and the use of intensive methods. Public requirements have changed in recent years, and the coarse, tough products that were once marketable are no longer accepted. The growing of salads has become a highly specialized business in several parts of England; the many problems that have arisen have been successfully solved; and there is no valid reason why the acreage under these valuable crops should not be greatly expanded. Many soils are suitable, and the handicap of our winter climate can be met by the wise application of the various methods of growing under glass as described in this Bulletin.

Sections are also devoted to the outdoor cultivation of lettuce, the raising of protected sowings for field planting, the "French Gardening" methods, the classification of varieties, and the methods practised in different parts of the country. The remaining salads are dealt with by means of surveys of the most successful methods of cultivation in use at home and abroad.

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THE Nova Scotia Seed-Growing Act, which was passed on April 18, 1932, for the encouragement of seed-growing, provides for the proclamation of areas for the

Nova Scotia growing of pure seed of farm and garden
Seed-Growing Act crops so as to prevent cross-pollination.

Power is given to determine the variety of seed or seeds to be grown in any given area: and the growing of an open-pollinated seed crop, other than that for which an area is proclaimed, is prohibited in that area.

Provision is made for the inspection, testing and approval of seed grown in the areas, and for penalties for breaches of the Act.

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REORGANIZATION OF THE PIG INDUSTRY

THE Report of the Reorganization Commission for Pigs and Pig Products,* which has been submitted for the consideration of the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, has just been published as one of the Ministry's series of Orange Books. The Commission was appointed last April under the Chairmanship of Colonel the Rt. Hon. G. R. Lane-Fox, to prepare schemes under the Agricultural Marketing Act, 1931, for regulating the marketing of pigs and pig products, and was instructed in so doing to investigate the manner in which the operation of such schemes could be facilitated by the quantitative regulation of imports of pigs and bacon and the way in which such regulation could best be undertaken in the public interest.

The Commission has confined its proposals to the bacon side of the industry. It is pointed out that whereas we already produce in this country most of our fresh pork supplies, home producers supply only about one-eighth of the market for bacon and hams.

The Report contains draft schemes for regulating the marketing of pigs and bacon, and makes recommendations for the regulation of bacon supplies by quotas, for the sale of bacon pigs on annual contracts, and for increasing the general efficiency of the pig and bacon industries.

As regards quotas, the Commission draws the conclusion that there can be no orderly expansion of the home industry so long as imports of bacon and hams are unregulated, and holds the view that regulation by quota is the method best suited to the needs of this particular industry.

Imports of bacon and hams in 1931 amounted to 11½ million cwt. This was nearly 2 million cwt. more than in the previous year and more than double the quantity imported before the war. Pig prices have, in consequence, been excessively low; thus, whereas agricultural prices as a whole in August (1932) were 5 per cent. above pre-war, those of bacon pigs were 14 per cent. below pre-war. Such a position is, in the Commission's view, dangerous from the standpoint both of the producer and the consumer. The low prices prevailing must lead eventually to a radical shrinkage of production both at home and abroad, with the result that before long prices must rise considerably. This process appears,

* *Report of the Reorganization Commission for Pigs and Pig Products*, Economic Series No. 37, obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, or through any bookseller, price 6d. net, post free 8d.

in fact, to have started already ; the Danish sow population, for example, in July (1932) showed a reduction of 22 per cent. below the previous year and other European countries are also reducing their herds. Constantly recurring alternations of over- and under-supply of pigs and of low and high prices—the “ pig cycle ”—are in fact a well-known feature of the pig industry throughout the world.

The Commission's quota proposals aim at eliminating the price cycle in this country and thus stabilizing production both here and, eventually, in those countries which cater mainly for the United Kingdom market. With this object they recommend that total annual supplies of bacon and hams should be limited to the average of the six-year period 1925-30, viz., 10,670,000 cwt. Of this total, the home industry should be allotted a quota based upon the volume of bacon that it can undertake to produce, and the remainder should be allocated to foreign countries annually as national quotas. Prices having thus, it is anticipated, been stabilized, room should be made for the ordered expansion of the home industry by providing for the increase of the home quota at a specified maximum rate, and for corresponding periodical reductions in foreign quotas. The rate of expansion suggested for the home quota is one that would enable the home industry to double its output in 2½ years.

In the Commission's view, the determination and allocation of quotas should be in the hands of an independent judicial body—the *Quota Advisory Committee*—similar to the existing Import Duties Advisory Committee. This body would be kept in touch with the import trade, and with internal distributors by a *Bacon Imports Advisory Committee*, representing the interests concerned, which would advise on the operation of the quota system from the traders' standpoint.

The Commission envisages the organization of the home industry by the formation of *Pig and Bacon Boards* under the Agricultural Marketing Act, 1931, and recommends the establishment of a co-ordinating body—a *Pig Industry Development Board*—consisting of representatives of the Marketing Boards together with a neutral element. One of the functions of this Board would be to act as the mouthpiece of the industry *vis-à-vis* the Quota Advisory Committee and to administer the home quota generally.

One of the most important of the Commission's recommendations is a requirement that all bacon pigs must be sold on annual contracts between feeders and curers. A universal contract system of this kind is, in the first place, an

essential part of the quota proposals. To use the Commission's own words "if total supply is to be stabilized, and if regulation is to be applied to imports, some steps must also be taken to stabilize the home supply, and to ensure that it shall be forthcoming." It is, therefore, recommended that the home quota should be based upon, and should not exceed, the amount of bacon represented by pig contracts in the hands of curers at the beginning of each quota period. Thus, once the initial limitation of imports were effected, there would be no further restriction on imports until guarantees of increased home output were forthcoming in the form of contracts.

Long-term contracts with deliveries at a specified rate such as are recommended are, moreover, regarded as essential to the orderly expansion of the industry, quite apart from their necessity for quota purposes. By adopting this method of sale, the present extreme uncertainty of supplies of pigs to factories would be removed and curers would be able to effect substantial economies in their manufacturing costs, and to carry out a consistent sales policy. Moreover, once the farmer had a firm contract for the sale of a specified number of pigs to a factory, he could frame his breeding and feeding policy so that he could turn out pigs of suitable bacon type instead of, as is so often the case at present, raising pigs that can, if required, be sold either for bacon or pork, but may be far from ideal for either purpose.

Farmers may, at first, feel some trepidation with regard to the Commission's contract proposals. Admittedly, they involve material changes in prevailing methods of selling pigs. To give the producer security, however, and thus encourage contracting, it is recommended that, though farmers and curers should be left to make their own contracts with one another, national contract terms should be negotiated between the Boards of pig producers and curers under the Agricultural Marketing Act. These terms should include a minimum price based on an agreed formula which should vary with the price of feeding stuffs, thus guaranteeing the reasonably efficient producer at least his costs of production. It is anticipated that the limitation of supplies proposed by the Commission would stabilize bacon prices at a level sufficient to bring this basic pig price within the curers' capacity to pay. The basic pig price is, however, only a minimum and provision is made for the negotiation of additions to it as and when justified by the course of bacon prices.

Moreover, to cover the producer against the possibility of

unintentional default on his contract, a number of safeguards are provided. Thus it is proposed that there should be a percentage tolerance on the number of pigs contracted to be delivered, and a range of weights between which pigs will be accepted by curers; contracts should be transferable between individual feeders and curers, and small producers should be at liberty to make collective contracts; a scheme of insurance against default through, for example, disease is also suggested.

The regulation of imports makes it necessary in the public interest not only that the home industry should give some guarantee that the required home supplies will be forthcoming—which is one of the objects of the contract system—but also that the industry should take steps to attain a high standard of efficiency. There must be some assurance that there will be nothing lacking in the quality of the home supplies that are to replace imports, and those supplies must be produced with the maximum economy. One of the principal objects of the proposed joint organization of feeders and curers, —the Pig Industry Development Board already referred to— would, therefore, be to carry out a policy of reorganization and rationalization within the industry. Moreover, in order further to ensure that the industry develops along right lines, it is proposed that a Permanent Reorganization Commission should be established by the State as a disinterested and non-political body, to initiate and examine plans for increasing efficiency. This body should not be limited in its purview to the pig industry, but should become, in effect, a statutory national planning body concerned with promoting organization in agricultural marketing.

The Commission devotes the latter part of its report to outlining a number of efficiency measures that it recommends should be put into effect by the Pig Industry Development Board, acting where possible through the Pig and Bacon Marketing Boards with their statutory powers.

On the producers' side, the establishment of standard quality-grades and weight-categories for bacon-pig carcasses, and the payment of differential prices for bacon pigs based on quality and weight, are recommended as the best means of stimulating the production of pigs of the required type. The adoption of the Pig Industry Council's breed and veterinary recommendations, legislation for boars, similar to the 'Scrub Bulls Act,' the encouragement of pig recording and litter testing and of improved production technique in general,

and the organization of the store pig trade, are also advocated. For economy in transport, organized assembly and transport of pigs to factories is recommended, and the possibility of arranging, with the railway companies, flat-rates, on a zone basis, is indicated.

As regards the bacon-curing industry, attention is drawn to the fact that factory capacity is at present in excess of supplies, that some factories are too small for efficient working, and that the geographical distribution of factories is not ideal. It is recommended that the Pig Industry Development Board should be given powers of rationalization over the bacon industry, and particularly that it should have authority to regulate the erection of new and the expansion of existing factories. It is also recommended that this Board should be empowered, where necessary, to finance and construct new factories, and the suggestion that it might even buy up and close down redundant or inefficient factories is also put forward for consideration.

Other efficiency measures recommended for the bacon industry are the increased use of the tank-cure process, the formulation of standard grades for bacon and hams, and the application of the National Mark, organized publicity for home-produced bacon and hams, research into the production and marketing of bacon and of pig offals, and the establishment of a reliable market-intelligence service.

July 1, 1933, is regarded by the Commission as the earliest possible date by which the scheme could come into operation. A preliminary six months' quota and contract period is recommended to start on that date, and provisional arrangements are suggested whereby direct negotiations as to contract terms and prices could meanwhile proceed, thus enabling contracts for bacon pigs to be signed before Boards under the Agricultural Marketing Act are set up. The whole scheme eventually depends, however, on the establishment of those Boards, and this is a matter where action would need to come from the producers themselves.

WHITE CLOVER TRIALS, 1926-1930

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IN common with all other cross-fertile species white clover is an extremely variable crop. It comprises a large number of fairly distinct races or ecotypes, many of which show very wide differences in regard to their agricultural value. So far, only a few of even the major ecotypes have been brought into cultivation; of these probably the best known are English wild white, ordinary white (or Dutch white), New Zealand white, Morsø (Danish), Strynø (Danish) and Ladino (Italian). Up to about 10 to 15 years ago, practically the only white clover sown in this country was ordinary white and English wild white, but, in recent years, New Zealand white clover has been sown in increasing quantities. There is already a great deal of information available with regard to the relative merits, for various purposes, of ordinary white and English wild white, but little is known concerning the merits of New Zealand white as a whole and still less concerning the different forms which constitute New Zealand white. The two trials described in this paper were conducted chiefly with the object of determining the agricultural value of the various forms of New Zealand whites in comparison with that of Dutch and wild white clover.

These two trials, hereafter referred to as A 112 and A 127, were carried out at the Welsh Plant Breeding Station. The soil was a medium loam which, although rather deficient in lime and phosphates, was very adaptable to indigenous wild white. Despite the fact that the ground was fallowed during the summer previous to laying down the trials, a considerable number of volunteer wild white plants appeared on the thinnest plots by the second and third harvest years.

Several samples of ordinary, New Zealand and wild white clovers were included in the trials. The seeds were sown on 1/200th-acre plots without a nurse crop. Each sample was replicated three times. During the first three harvest years the plots were cut twice each year, usually towards the end of June and about the middle of September; and the produce was weighed green. At each cut, two representative samples were taken from each plot for the purpose of determining the air-dried weights and the actual amount of white clover present. All the yields obtained are given in terms of lb. of air dried fodder per acre.

Since white clover is essentially a sward-forming plant, it is realized that the conditions under which these trials were conducted were somewhat artificial. To simulate pasture conditions, the plots should have been cut far more frequently than twice a year.

Description of Forms Tested.—In order to avoid any misunderstanding as to what is meant by the terms ordinary white, English wild white and New Zealand white clover, brief descriptions of these three forms are given below.

Ordinary White Clover.—The race of white clover known in the seed trade as "Ordinary" white clover, or as it is sometimes called "Dutch," is not indigenous to the British Isles. It is quite a distinct type from English wild white although the two forms inter-cross quite freely. The fact that the wild white clover over wide areas of Central and Eastern Europe is very similar to the cultivated clover strongly suggests that the so-called "Dutch" white is derived from the indigenous clover of that region.

A fair amount of seed of ordinary white clover is produced in the East of England, particularly in Essex, but the great bulk of the seed sown in this country is imported, largely from Eastern Europe. Despite its wide distribution, ordinary white clover is remarkably uniform and is very similar in general type whether it has been grown in Essex or Silesia.

The individual plants of ordinary white clover are stronger and more robust than those of English wild white. Ordinary white has a longer growing season than English wild white; it starts growth sooner in the spring, blooms about two weeks earlier, and continues growth later in the autumn. As compared with the native white clover, Dutch white plants have larger leaves, and fewer and stout runners. Partly on account of the fact that the internodes are longer, and that the runners do not take root at the nodes so readily, Dutch white is not able to spread vegetatively nearly as freely as English wild white, and this to some extent explains its lack of persistency.

English Wild White is indigenous to this country. It flourishes on nearly all types of soil throughout Great Britain and Ireland, but does not appear to be indigenous on the Continent, though races not very unlike English wild white are known to exist in certain parts of Europe. For instance, types not very dissimilar to English wild white have been observed by the writer in some very old pastures in Denmark and Sweden. It is also clear, from samples obtained from old pastures in Switzerland and Czechoslovakia, that races fairly similar to English wild white occur on the Alps and Carpathians.

Most of the wild white clover in this country is of the same general type and, in most instances, samples obtained from old permanent pastures in most districts are indistinguishable from those harvested from old permanent pastures in Kent or Essex. This does not imply that English wild white is a homogeneous race; on the contrary, it is known to contain many local races or minor ecotypes which have become adapted, as the result of natural selection, to the conditions under which they are found. Some of these local races are almost indistinguishable from the major types, while others often show very wide differences, especially in regard to important agricultural characteristics, such as rate and extent of spreading and density of growth. It is known that the type generally found on the Wiltshire Downs differs slightly from that found growing in Herefordshire and

Gloucestershire, which in turn differs, but to a lesser degree, from the typical Kentish wild white. Very often the type growing on very old permanent meadows differs perceptibly from that on old permanent pastures, owing to the fact that it contains an appreciably larger proportion of lax plants with slightly larger leaves. The local race growing indigenously, at least in certain districts in the North of Scotland, may be cited as an instance of an extreme type of wild white. The plants of this particular local race are appreciably smaller and more lax than those of typical wild white, the leaves also are smaller, and flowering occurs earlier than in typical wild white. Another extreme type of wild white was obtained recently by the writer from a certain old pasture in Cheshire. In this case the plants were very much smaller, denser and slower growing than the type usually found on old pastures.

English wild white differs from ordinary white in having a much denser habit of growth, smaller and darker green leaves, more slender and more numerous runners with shorter internodes; but perhaps its most outstanding characteristic, and one that is chiefly responsible for its greater permanence, is the readiness with which it reproduces itself vegetatively.

New Zealand Clover is extremely variable. For trade purposes it is classified into two major types: (1) New Zealand ordinary and (2) New Zealand wild white. Within these two main groups, again, there are several more or less well-defined types that differ greatly in agricultural value. As a result of their investigations at Palmerston North, New Zealand, Davies and Levy* have classified New Zealand whites into four main types, viz., (1) a large-leaved, widely-spreading, stout-stemmed and highly-productive type; (2) a medium-leaved type with slender stems and with more compact growth-habit than type (1); (3) ordinary New Zealand white; and (4) a lax, early-flowering type not unlike the European cultivated clover.

The origin of New Zealand white is not known. As white clover is not indigenous to the Dominion, the seeds must have been originally introduced from Europe. From the general characteristics of the individual plants, it seems extremely unlikely that it has been derived from English wild white, either directly as a result of natural selection, or indirectly as a result of inter-crossing with some other form, for the New Zealand wild whites are totally different in general appearance and growth habit from English wild white. The fact that certain forms of wild whites, indigenous to France, resemble New Zealand wild white far more closely than any of the other European wilds so far studied, suggests the possibility that New Zealand wild white may have originated as a result of inter-crossing between these forms and ordinary white clover.

In addition to ordinary English wild and New Zealand whites, a fourth kind was included in one of the trials (A 112). This was designated as "American" by the seed firm from which it was received, but it was quite different from any other sample of American white the writer has seen. Judging from its botanical characteristics and its performance in the field, it was very probably a large-leaved New Zealand type.

A 112 Trial: Comparison of Yields of the Various Forms.—This trial was laid down in 1926. The clovers tested were: English wild white, represented by two samples from Kent, one from Gloucestershire and one from Breconshire; ordinary

* Davies, Wm., and Levy, E. Bruce. (1931.) Strain investigation of grasses and clovers: (4) White Clover (*Trifolium repens*). *New Zealand Jour. Agric.*, Vol. 42, Nos. 2 and 3.

white, represented by three samples, one grown in Essex, another obtained from Poland, and a third the origin of which is not known; three samples of New Zealand, the exact sources of which are not known, though it was evident from the general appearance that two were fairly good types of cultivated New Zealand white and the other was a large-leaved form; and one sample of reputed "American" white. The seeds were sown at the rate of $1\frac{1}{2}$ million viable seeds per acre, which is equivalent to an average seeding of about 2 lb. per acre, in a simple mixture consisting of perennial ryegrass (12 lb. per acre) and rough-stalked meadow grass (2 lb. per acre).

The average yields for the four main forms are given in Tables I and II.

TABLE I.—TRIAL A 112: THE AVERAGE YIELDS OF WHITE CLOVER PRODUCED DURING EACH OF THE FIRST THREE HARVEST YEARS. AIR-DRIED WEIGHTS IN LB. PER ACRE.

Form	1st harvest year: 1927		2nd harvest year: 1928		3rd harvest year: 1929		Total 1927-1929	
	Lb.	Relative	Lb.	Relative	Lb.	Relative	Lb.	Relative
English Wild White..	1,400	100	924	100	792	100	3,116	100
New Zealand	1,224	88	800	87	616	78	2,640	85
"American"	1,510	108	826	89	632	80	2,968	95
Ordinary (Dutch) ..	704	50	418	45	448	57	1,570	51

TABLE II.—TRIAL A 112: AVERAGE WEIGHT OF TOTAL FODDER (GRASSES AND WHITE CLOVER) DURING THE FIRST THREE HARVEST YEARS (1927-1929). AIR-DRIED WEIGHT IN LB. PER ACRE.

Form	1st harvest year: 1927		2nd harvest year: 1928		3rd harvest year: 1929		Total 1927-1929	
	Lb.	Relative	Lb.	Relative	Lb.	Relative	Lb.	Relative
English Wild White..	4,252	100	5,572	100	3,962	100	13,786	100
New Zealand	4,554	107	5,180	93	3,464	87	13,198	96
"American"	5,034	118	4,882	89	3,494	88	13,410	97
Ordinary (Dutch) ..	3,416	80	4,094	73	2,904	73	10,414	76

The results given in Table I are very interesting. They show clearly that the English wild clover plots gave, with one exception, appreciably more white clover than the three other forms included in the trial during each of the three years. Expressing the yield of the other three forms as percentages of that of wild white, the percentage weights of white clover yielded by the New Zealand plots in the first,

second and third years were 88, 87 and 78 respectively; the corresponding percentage yields from the American plots were 108, 89 and 80 and from the Dutch white plots 50, 45 and 57.

The results obtained from the Dutch white plots in the second and third years are very misleading, as they place Dutch white in far too favourable a position. Although no weights were obtained in the seeding year, it was evident, from the observations made on the plots, that Dutch white produced considerably more growth in that year than any of the other forms. After the seeding year, the Dutch white deteriorated rapidly, and, from the poorness of these plots in the first harvest year, it was quite evident that winter-killing must have been very severe during the first winter. By the spring of the second harvest year, the sown white clover had become extremely thin, while volunteer white clover, which could be easily distinguished from Dutch white plants, had already started to colonize the ground vacated by Dutch white. It is estimated that, in the second harvest year, about 50 per cent of the clover in the Dutch white plots was volunteer wild white, while, in the third harvest year, the volunteer plants constituted at least 90 per cent. of the clover on this plot. In contradistinction to Dutch white, wild white, New Zealand and "American" showed progressive improvement from the seeding year to the end of the first harvest year. Although these plots were less productive in the second harvest year, the swards were quite as dense as in the first year. By the third year, the New Zealand and "American" plots were showing definite signs of thinning, but the wild white plots were still well covered.

The results given in Tables I and II bring out an important fact. They show that there is a fairly close connexion between the amount of white clover in the sward and the total yielding capacity of that sward. A comparison of the yields given by the English wild white and ordinary white clover plots brings out this fact very clearly. The total yields of white clover and grasses during the first three harvest years from the wild white and ordinary white clover plots were:—

					<i>Lb. of dry fodder per acre</i>	
					<i>White clover</i>	<i>Grasses</i>
Wild white plots	..	..	..	..	3,116	10,670
Ordinary white plots	..	..	..	..	1,570	8,844

These figures show that the amount of white clover present had quite a considerable indirect influence on the contributions of the other components of the mixture. There was no doubt, from the general appearance of the plots, that the increased

yield of grasses on the wild white plots was due to the increased fertility, particularly the nitrogen content, of these plots. The rich, green colour of the grasses on the wild white, New Zealand and "American" clover plots formed a marked contrast, especially in the spring and autumn, to the rather sickly light-green colour of the ordinary white clover plots.

There was also a considerable difference between the various clovers in regard to their ability to keep weeds in check. By the autumn of the first harvest year, crowsfoot and daisies were very abundant on the ordinary white clover plots, while the wild white plots remained remarkably free from weeds until the end of the third harvest year, when the clover was beginning to show signs of thinning. The New Zealand and "American" plots were also comparatively free from weeds, but less so than the wild white plots.

Comparison of the Yields of the Different Lots within each Form : Ordinary White Clover. The average yields of clover given in the first harvest year by the three lots of ordinary white clover in this trial are shown below. The yields obtained in the two subsequent years are not strictly comparable on account of the colonization of the plots by volunteer wild white.

					<i>Yield of White Clover</i>
<i>Source of seed</i>					<i>Lb. of dry fodder per acre</i>
Essex grown	..	..	..	..	942
Polish grown	..	..	..	..	518
Not known	..	..	..	..	650

The above results indicate that the Essex-grown lot was appreciably more productive than either the Polish-grown sample or the other lot, the source of which is not known. Though the Essex-grown was considerably superior to the other two ordinary white clover samples, it gave a very considerably lower yield than the wild white lots (except one) and the New Zealand lots.

New Zealand White Clover.—As already stated, three samples were tested, but their precise sources of origin are not known. However, judging from their appearance, two lots were good types of cultivated New Zealand whites, while the other type was a luxuriant large-leaved form indigenous in certain districts of New Zealand.

The average weights of clover yielded by these two forms during each of the first three harvest years were :—

		<i>Dry fodder per acre</i>						<i>Total</i>	
1927		1928		1929					
	<i>Per</i>		<i>Per</i>		<i>Per</i>				
	<i>Lb.</i>	<i>cent.</i>	<i>Lb.</i>	<i>cent.</i>	<i>Lb.</i>	<i>cent.</i>	<i>Lb.</i>	<i>Per</i>	<i>cent.</i>
Large-leaved									
New Zealand	1,602	100	866	100	846	100	2,314	100	
Cultivated									
New Zealand	1,035	65	766	88	500	59	2,301	70	

As seen from the above results, the large-leaved form proved considerably more productive than the cultivated form in each of the three years. Although the larger-leaved form was not so productive as some of the best lots of English wild white, it excelled the latter in one important respect. The chief defect of English wild white is that its seasonal period of growth is very short. The large-leaved New Zealand form has a much longer growing season as it starts active growth appreciably earlier and continues growth later into the autumn.

English Wild White Clover.—As previously explained four lots—two from Kent, one from Gloucestershire and one from Breconshire—were included in this trial.

The yields of clover given by these four lots were as follows:—

Source	1927		1928		1929		Total	
	Lb.	Per cent.	Lb.	Per cent.	Lb.	Per cent.	Lb.	Per cent.
Gloucester-shire ..	1,700	100	936	100	1,048	100	3,684	100
Kent (A) ..	1,584	93	902	96	816	78	3,302	90
Breconshire	1,418	83	786	84	856	81	3,042	83
Kent (B) ..	902	53	692	74	446	43	2,040	55

All four lots were of the true English wild type. As seen from the above results, the Gloucestershire lot gave in this trial consistently better results than the three other lots. It should, however, be clearly understood that these results do not imply that all Gloucestershire wild whites are superior to those indigenous to Kent and Breconshire; they merely indicate that the particular lot from Gloucestershire tested was more productive and more persistent in this particular trial than the other lots tested. As already pointed out, English wild white, far from being homogeneous, has been found to consist of a comparatively large number of minor strains differing more or less in their agronomic values. The great difference in the productiveness of the two lots A and B, obtained from Kent, will serve to emphasize the wide variation that may sometimes occur between samples obtained from adjacent districts. As regards their general botanical characteristics, the two lots A and B were indistinguishable and apparently the only feature in which they showed any appreciable difference was in their rate of growth—lot A was capable of making much more rapid growth and of covering the ground more effectively than lot B.

A 127 Trial.—In this trial, which was laid down in 1927, one lot of English wild white from Kent, one lot of ordinary white grown in the eastern counties, and seven lots of New Zealand white clover were tested. The seven New Zealand lots have been classified, on the basis of their growth habits and their general performance in the field, into five types, viz.: (1) one lot was a large-leaved form very similar to the lot tested in the trial already described. The pasture from which this sample was obtained is known to be a fairly young one, but its exact age was not stated; (2) three lots from permanent pastures which had been down for over forty years; (3) one lot from a 15-year-old pasture; (4) two lots of ordinary cultivated seeds taken from two- to three-year-old pastures; and (5) one sample of stubble seed, that is, seed harvested from a crop which had established itself voluntarily on the stubble the previous year.

The white clover seeds were sown on triplicate plots at the rate of 10 lb. per acre, along with Italian rye-grass sown at the same rate.

The yields of white clover in the hay and aftermath during each of the first three harvest years are shown in Table III,

and the yields of total fodder (grasses plus white clover) are given in Table IV.

TABLE III.—A 127 TRIAL: AVERAGE YIELD OF WHITE CLOVER PRODUCED DURING EACH OF THE FIRST THREE HARVEST YEARS. LB. OF AIR-DRIED WHITE CLOVER PER ACRE.

Form	1st harvest year: 1928		2nd harvest year: 1929*		3rd harvest year: 1930		Total 1928-30	
	Lb.	Rela- tive	Lb.	Rela- tive	Lb.	Rela- tive	Lb.	Rela- tive
English Wild White	988	100	460	100	822	100	2,270	100
New Zealand Whites								
Large-leaved form	1,490	151	584	127	966	118	3,040	134
(A) Wild (from pasture over 40 years old) ..	1,210	123	518	113	774	94	2,502	110
(B) Wild (from pasture 15 to 20 years old) ..	1,236	125	284	62	324	39	1,844	81
Ordinary (culti- vated)	1,033	105	300	65	237	29	1,570	69
Stubble	740	75	372	81	294	36	1,416	62
Dutch (ordinary) ..	742	75	160	35	212	26	1,114	49

* The low yields in this year were due to the drought that occurred during the months of May and June.

Discussion of Results: English Wild White.—As seen from Table III, the results given by English wild white clover in this trial were rather disappointing. Although the indigenous clover was thicker and formed a closer sward than any of the other forms, it yielded in the first harvest year less clover than all the New Zealand forms with the exception of the "stubble" lot. It showed up to much better advantage in the two subsequent seasons. In the second harvest year, it outyielded all the other clovers except the large-leaved New Zealand and the New Zealand wild from pastures over 40 years old, while in the third harvest year it surpassed all the other forms except the large-leaved lot.

Large-Leaved New Zealand White.—This proved to be the most productive lot in the trial. It produced in every season consistently heavier yields than any of the other lots, and gave during the first three harvest years 51 per cent., 27 per cent. and 18 per cent., respectively, more clover than English wild white, and 23 per cent., 13 per cent. and 25 per cent., respectively, heavier crops than the New Zealand wild white lots from pastures over 40 years old. This clover was taller, more luxuriant, and recovered more rapidly after cutting, than the other lots tested. In common with other New Zealand forms, it had a longer growing season than English wild white.

New Zealand Wild from Pastures over 40 years old.—As already stated, three samples of New Zealand wild white obtained from fields which were tantamount to permanent pastures were included in this trial. As all three gave very similar yields only the average results are given in Table III. These three lots gave excellent stands of clover during the first two seasons. In the first year they outyielded English wild white by 23 per cent. and in the second year by 13 per cent. They were still very good in the third harvest year, but were beginning to show signs of falling off.

New Zealand Wild from 15- to 20-year-old Pastures.—This lot gave a very good crop in the first year when it out-yielded English wild white by 25 per cent., but it deteriorated rapidly during the second and third years.

New Zealand Ordinary Cultivated White Clover.—The two lots of New Zealand cultivated white clover tested produced in the first harvest year slightly better crops than English wild white, but were considerably less productive than the large-leaved form and the New Zealand wild. On account of heavy winter killing, they produced only fair crops in the second year, and by the third year the stands were very thin. In the third season, there was more than three times as much clover on the New Zealand wild (A type) plots and about four times as much clover on the plots of the large-leaved New Zealand form as on the plots of the New Zealand cultivated white clovers.

Stubble White Clover.—This lot was very similar to the New Zealand ordinary in general habit. It gave a poorer crop in the first year and a rather better crop in the second year than the New Zealand ordinary, but both forms were about equally poor in the third year.

Dutch White Clover.—As in the previous trial Dutch white gave very poor results. It was 25 per cent. less productive than English wild white and about 100 per cent. poorer than the large-leaved New Zealand form in the first harvest year. As most of the plants died back during the second winter, the contributions of Dutch white in the second and especially in the third year are practically negligible and were far lower than is indicated in Table III. It was estimated that in the second harvest year at least 50 per cent. and in the third harvest year about 80 per cent. of the clovers on the Dutch white plots were volunteer wild white clover.

TABLE IV.—A 127 TRIAL: THE TOTAL YIELD OF AIR-DRIED FODDER (GRASSES AND WHITE CLOVER) PRODUCED DURING EACH OF THE FIRST THREE HARVEST YEARS. LB. PER ACRE.

Plots	1st harvest year: 1928		2nd harvest year: 1929		3rd harvest year: 1930		Total 1928-1930	
	Lb.	Relative	Lb.	Relative	Lb.	Relative	Lb.	Relative
English Wild White	4,736	100	2,740	100	6,256	100	13,732	100
New Zealand Whites								
Large leaved form	4,724	99	2,524	92	6,502	104	13,750	101
Wild (from pastures over 40 years old)	4,506	95	2,470	90	5,850	94	12,826	93
Wild (from pastures 15 to 20 years old)	4,850	102	2,496	91	5,608	90	12,954	94
Ordinary (cultivated)	4,167	88	2,428	89	5,148	82	11,743	86
Stubble	4,084	86	2,196	80	5,124	82	11,404	83
Dutch (ordinary) ..	4,052	86	2,092	76	5,076	81	11,220	82

The figures shown in Table IV are interesting in that they emphasize the point discussed in connexion with the similar results obtained in the previous trial—that total productiveness of the plots is fairly closely correlated with the amount of white clover present. For example, the plots with English wild white and the large-leaved New Zealand white gave considerably more total fodder than those with New Zealand ordinary, stubble and Dutch white clover.

General Conclusions.—The results of the two trials described in this article prove conclusively that, under the conditions

in which these tests were carried out, ordinary white clover is much less productive than English wild white and most types of New Zealand white clovers, even in the first harvest year. In these two trials, the average yields of *ordinary white clover* during the first year were 50 per cent. (in A 112 trial) and 75 per cent. (in A 127 trial) of those given by *English wild white clover*. Most of the ordinary white clover plants died back completely during the second winter; the few that did survive were very small and non-productive, with the result that the inferiority of Dutch white clover in the second and third harvest years was even more pronounced than in the first year.

There is no doubt, from evidence obtained from other trials that have been carried out by the Welsh Plant Breeding Station at various centres, that Dutch white clover is totally unsuited to Wales. It is mistaken economy on the part of West Country farmers to include ordinary white clover in one-year leys even though the seed is considerably cheaper than New Zealand and English wild white. It is possible, even in the arable areas of the East of England, where ordinary white clover is generally regarded as indispensable for one-year leys, that better crops would be obtained if some of the best types of New Zealand white clover were used.

In one of the trials, a certain amount of evidence was obtained which suggested that home-grown seed of ordinary white clover is more productive than imported seed.

English wild white is a heterogeneous form. It consists of a number of ecotypes, some of which differ widely in regard to important agricultural characteristics such as rate and density of growth. The variability of English wild white is well exemplified by the difference in the performance of the two Kentish wild white samples included in one of the trials (A 112). Although the two lots were so similar in regard to size of leaves and density of growth as to be indistinguishable, they differed greatly in their rates of growth. Despite the fact that the plots of both samples had equally good stands of clover, one lot, by virtue of its more rapid growth, gave consistently heavier crops during the whole period of the trial. In the first harvest year it was 76 per cent., in the second year 32 per cent. and in the third year 83 per cent. more productive than the other lot from Kent. Even greater differences than those recorded above have been observed between other lots of genuine English wild white clover.

At present, all types of wild white clover that conform to a

certain pre-conceived standard in regard to size of leaves, density of growth and time of blooming are classified as genuine wild white, irrespective of their real agricultural value. In view of the great differences that have been shown to occur between various types of wild white clover in regard to their productiveness, it is evident that, in any scheme of certification of wild white clover for seed, due consideration should also be given to the rates of growth and degree of persistency of the crops—which after all are the most important properties of wild white clover.

New Zealand white clover has been found to be extremely variable. It consists of a wide range of types, some of which are only slightly better than ordinary white clover, while others are actually more productive than English wild white during the first few years.

The New Zealand white clover seed is divided by the trade into “wild” and “ordinary.” As a rule the wild types, which, incidentally, are totally different from English wild whites, are more productive and more persistent than the types which usually constitute the New Zealand ordinary; but this rule does not apply in all cases, as both the “wilds” and “ordinary” have been found to contain good and poor types.* It may be stated that, in general, even the poorest types of the New Zealand whites are slightly better under Welsh conditions than the best of the Dutch whites, while the best types of New Zealand whites, since they are far more productive and more persistent, are greatly superior to the latter.

Of the New Zealand whites so far tested, a type characterized by large leaves and strong-growing habit has been proved to be the most productive as well as the most lasting. By virtue of its earlier and more rapid growth, this type is better adapted than English wild white to one- and two-year leys. It has been shown in these trials to be capable of lasting remarkably well for at least three years.

* Recently, the New Zealand Department of Agriculture has modified its scheme for the certification of white clover. Under the amended scheme, the only type of white clover that will receive the certificate of the Department is a regional strain which is known to combine great persistence with an abundance of dense, leafy foliage; so that, in future, the white clover seed exported from New Zealand will fall into two main classes: (1) New Zealand white clover certified seed, which will be sold in bags bearing the Government seal, and (2) the uncertified ordinary New Zealand white clover seed. For fuller particulars of this scheme, see the last (October, 1932) issue of this JOURNAL (p. 605), and the *New Zealand Journal of Agriculture*, November, 1931.

THE MUSK RAT IN GERMANY

THE musk rat or musquash is a native of North America, where it is trapped for its fur. In 1905, a few pairs were released in Central Europe, where they have multiplied so rapidly and done such extensive damage that the German and other Governments have had to take active steps to keep them in check. Musk rats infest streams, canals, ponds and ditches, and do great damage by burrowing in the banks and by building obstructions in the beds of streams. They also cause damage to agricultural crops, fresh water fish and molluscs, and may attack small live stock.

A few years ago, these animals were introduced into England to be kept and bred for their pelts. Some have escaped from fur farms in various parts of the country, thus giving rise to the dangers already mentioned. This led to the passing of the Destructive Imported Animals Act, 1932, which empowers the Minister of Agriculture and Fisheries and the Secretary of State for Scotland to regulate the importation and keeping of these animals. Although musk rats can now only be kept in this country under conditions which minimize the risks of escape, the problem of eradicating those which are already at liberty still remains. In Shropshire, for example, the Ministry, in collaboration with the County Agricultural Committee, is having to conduct an extensive campaign of trapping, as musk rats which escaped locally have multiplied and are spreading rapidly along the valley of the Severn.

Particular interest, therefore, attaches to the experience of the German authorities in controlling musk rats. With the object of studying the German methods, Mr. Martin A. C. Hinton, Deputy Keeper of Zoology at the British Museum (Natural History), and Mr. E. C. Read, the Ministry's Technical Adviser on Rat Destruction, attended, on behalf of the Ministry, the German State Conference on musk rat control held at Saal (Donau) in June this year; they subsequently had an opportunity of discussing the problem with the chief officials concerned in Bavaria and Thuringia, and of seeing some of the field work in those States. This article is based on the report of their visit, and on information on administrative questions kindly supplied to the Ministry by Dr. Martin Schwartz of the German State Biological Institute.

The problem of musk rat control in Germany has now assumed formidable dimensions, and the authorities at present can do little more than hinder the westward progress of the musk rats, and protect at great cost certain important

structures such as the Rhine-Danube Canal in Bavaria and the Great Saale Dam in Thuringia. The whole eastern portion of Bavaria, a large part of Thuringia, practically the whole of Saxony, and large portions of Prussia and Silesia are heavily infested. In these heavily-infested areas, little more can be done at present than to thin down the musk rat population; the losses inflicted on the rats are more than repaired each year, not only by the rapid breeding of the survivors, but by the continual influx of newcomers from Czecho-Slovakia. The methods adopted in Germany as a whole have, however, resulted in a considerable reduction in the numbers of musk rats, and have made it possible to reduce the pace of their spread to territory not hitherto infested. If sufficient money were available, and if the migrations from Czecho-Slovakia could be stopped, the Germans, with their present highly-developed technique, could eradicate the musk rat altogether.

The authorities are unable to give any estimate of the present population of musk rats in Germany (one estimate placed the musk rat population of Central Europe as 100,000,000 in 1925). The total number killed in Bavaria, Thuringia, Saxony and Anhalt during 1930 was 30,222; no data are available from other States.

The musk rats can advance with great rapidity. Dr. Pustet, who is in charge of musk-rat control in Bavaria, ringed several musk rats and liberated them; the greatest wanderer was a male, captured fifteen days after liberation at a point 50 kilometres (about 30 miles) above the place where it was released; this animal had already constructed its burrows on the new ground, so that the long journey, made against a strong current, must have been made in less than 15 days.

The keeping of musk rats is forbidden except for the purpose of scientific experiments by State officials. All occupiers of land, and those entitled to game and fishing rights, as well as the authorities responsible for public and private waters, canals and other means of communication, are under an obligation to report the appearance of musk rats. Rewards are paid for each musk rat killed by private individuals. One mark per rat is paid in Prussia, 80 pf. elsewhere. When a fresh outbreak is detected, 3 marks is the reward for the first animal produced.

The official departments responsible for the destruction of musk rats in the individual German States present an annual report as to the incidence of the musk rats in their territory

to the Central State Biological Institute, which issues a general report on the spread of musk rats in Germany, as well as a map of the territory colonized. A continual publicity campaign is conducted for the information of the public. In addition to the issue of leaflets on the best ways and means of musk-rat control, suitable pictorial posters are exhibited in schools, the offices of the local authorities, and sometimes on railway stations and in hotels and restaurants. In Bavaria, a film has been prepared to illustrate the damage done by musk rats and the best means for their eradication. Special attention is paid to those districts which become freshly infested. The annual cost of this publicity service is between 7,000 and 9,000 marks.

In *Prussia*, five official musk-rat destroyers are employed in the Prussian provinces of Saxony and Upper and Lower Silesia. Suitable private persons are taught how to destroy musk rats, being paid premiums, but no regular wage. In *Bavaria*, the musk-rat control is under the direction of a scientist, one official chief destroyer, and six assistant destroyers. There is also, in several districts, a service of control managed by the District Fishery officials. In the Free State of *Saxony*, there is a permanent chief trapper with eight assistants. In addition, there are some 150 to 200 voluntary trappers who are supplied, as are the other trappers, with all the necessary apparatus for trapping musk rats; they are only paid rewards and are allowed to keep the skins. In *Thuringia* there are five musk-rat trappers. Cases of infestation have been reported in *Württemberg* and *Baden*, and trappers are to be trained to deal with the menace.

In 1931, the Central Ministry for Food Production and Agriculture made grants totalling 65,000 marks to the various States engaged in musk-rat control work. Contributions were also received from the Ministry of Transport, the State Record Management, and the local railways. The annual cost of the service in Bavaria is about 40,000 marks, made up as follows :—

	Marks
Official catchers (seven)	18,000
Publicity	1,200
Research and assistance	5,000
Special Musk-Rat Research Station	800
Travelling	400-800
Grant in aid of private catchers	10,000
Apparatus	4,000-6,000

At the conclusion of the Inter-State Conference on musk-rat control, the delegates went to the Valley of the Danube

to see Herr Roith, the chief trapper for Bavaria, exterminate two or three colonies of musk rats which had recently become established near Saal. Messrs. Read and Hinton say :—

“The site was an alluvial flat traversed by a railway on a high embankment. On either side of the embankment was a large pool of water, replenished no doubt during the winter by floods from the Danube a few yards away, but, in the summer, stagnant and overgrown with reeds and other water plants. The banks shelved gently into the water and, at first sight, there did not seem anything for a musk rat to fasten its teeth upon. No burrows were visible at all. On looking at the reeds, however, we noticed seven or eight places on one pond where the reeds had turned yellow and then, on getting nearer, we saw that many had been bitten off and were floating in the water. In the next pond across the railway embankment there were several similar places and at one of these we found Roith at work. He paddled about in the water discovering the various entrances to the burrow. All these were stopped carefully with the exception of two, one at each end. Before these two, Roith arranged cage traps under water and very carefully concealed them with reeds and mud. Then he proceeded to probe the ground gently with a peculiar steel walking stick, and, having ascertained the course of the burrow and its ramifications, he probed deeper and systematically so as to drive the rats forward from the termination down to the subaqueous mouths. This work, of course, took a considerable time. It was rewarded by the capture one after another of five half-grown musk rats and an adult female. These were caught alive, driven one after another into one of the cage traps. When the rat was reluctant to leave the burrow Roith waggled the steel stick in the ground close behind it so as to produce an alarming splashing noise in the burrow; if that did not suffice he opened the burrow behind, lit a small rocket, giving off an odorous gas with a luminous explosion. At each stage of the proceedings, after the initial gentle probing, Roith seemed to have perfect knowledge of what was happening underground and of the precise position of each rat. The trapping of each was indicated by bubbles of air rising from the submerged trap.

“On June 29, we met Roith at Abensberg and went with him to exterminate a colony of musk rats which had recently been established in a little back-water or drain leading to a small tributary of the Danube. On the way, we saw several places at which more or less serious damage had been done, in this and the previous year, to the banks of the stream itself, and Roith pointed out the sites of colonies he had cleared out. At the little back-water, Roith repeated the performance which we had observed the previous day at Saal. Again, no burrows were to be seen, but only reeds which had been bitten off. Roith waded into the water, found the holes, stopped all but two, set the traps and began to probe. In about an hour he cleaned the colony out, five young rats, a three-quarters grown male, and an adult female pregnant with eight embryos. The rats were taken from the trap by the tail, held up in the air, and quickly killed by a sharp blow on the neck with the edge of the hand. Then he said: ‘Now, I will show you the nest,’ and quickly lifting the turf at one point he exposed a deep chamber just under the grass. In the bottom of this was the nest, with eight or nine babies on which the fur had hardly commenced to grow. Again Roith showed us that he

had a perfect knowledge of that portion of the underworld with which he was at the moment particularly engaged.

* * * *

“Roith gave us an illuminating account of the work. He said: ‘Right people, plenty of time, plenty of money—that is the whole essence.’ The area for one man depends entirely on the conditions. Twenty kilometres square could be cleaned by one man working day by day if the place were rich in water. You can catch better on moonlight nights than by day. A proper musk-rat trapper must know how to disturb the colony properly; for if he disturbs it thoroughly he can take the whole lot in one operation, using the big trap (which we did not see in use). The trappers must be trained biologically; they must know the habits and the life history. The trapper must know when he has caught the last rat. Roith knows when he has done this; but many who have thought they possessed this knowledge have had the experience of seeing Roith take another 20 or 30 musk rats from the ‘cleaned-out’ colony. Ordinary Canadian experience does not teach you to know when you have taken the last animal. When you have merely thinned the colony out your trouble is greatly increased to find what is left. Exact technique is essential. The more careful the preliminary survey, the better the chance of cleaning up the district. The great factor in dealing with an area from which few or no reports have been received is that the person sent to make the survey should know what to look for.

“In cleaning an area, it has to be realized that the same means is not suited for use in all localities and that animals have brains too. There are also favourable and unfavourable days; failing to catch any musk rats does not mean, necessarily, that there are none. In one burrow, with stone on each side, 20 musk rats may be living. Of these you may catch five or six, one by one; but if you know your job and make your preliminaries correctly, you can take the lot in one go. The trapper must be a trained man—not a mere agricultural labourer; he must be able to decide what means to adopt in the special circumstances of each particular job.”

The German experience has been that gassing, poison or virus are not effective methods of eradication. Good runs are kept undisturbed for trapping the animals; if the runs are disturbed the rats go away and make fresh ones. The campaign is carried out continuously throughout the year. In Bavaria, where the winter is severe and long, it is found that the best time to catch the musk rats is during the spring migration (April, May and June) and in the late autumn (September and October). In Thuringia, the summer is chiefly employed in survey work and in watching and controlling the results of migration; the chief campaign of slaughter takes place in winter, becoming more and more intense down to the time of the birth of the first litter.

In North America, musk rats are only tolerated in marshes unfit for anything else, and field observations on the Danube show that the musk rats make their own marshes. As they tunnel each year into the meadows bordering the River, the

banks collapse and the River is progressively widened until at last the meadows are converted into swamps. Messrs. Read and Hinton saw this process beginning in the Danube Valley at many points. The effect produced in a couple of years was quite striking, and if the musk rats were left alone, all the costly work of drainage, irrigation and embankment would be undone in a comparatively short space of time.

NOTE.—Under the Musk Rats (Importation and Keeping) Order, 1932 (Statutory Rules and Orders, 1932, No. 153), musk rats may only be imported or kept in Great Britain under a licence granted by the Ministry of Agriculture and Fisheries or by the Department of Agriculture for Scotland. The conditions under which licences are granted and the fees payable are set forth in the Musk Rats (Importation and Keeping) Regulations, 1932 (Statutory Rules and Orders, 1932, No. 154). Copies of the Order and Regulations may be obtained, price 1d. and 2d. respectively, from His Majesty's Stationery Office, or through any bookseller. The Ministry has issued an illustrated pamphlet on the musk rat (Form No. A.767/L.P.), a copy of which may be obtained, gratis and post free, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

THE STUDY OF WEATHER AT AGRICULTURAL INSTITUTES

Sir NAPIER SHAW, Sc.D., LL.D., F.R.S.

EVERYONE is aware that the growth of crops, the world over, depends on sunshine, warmth and rainfall, and the questions which agricultural meteorology is designed to answer are, for any specific locality, how much sunshine, how much warmth, how much rainfall, and what distribution of those influences during the period of growth, or in anticipation of that period, are most favourable to the success of the crop.

Climate and Weather.—Certain aspects of these questions are also matters of common knowledge. The allowance of sunshine, warmth and rainfall varies in different countries and in different parts of the same country. For any particular site its aspect, its height above sea-level, its nearness to or remoteness from the sea, from the great oceans or the great continents, all affect the conditions; and, primarily indeed, its latitude controls the length of day and night at different seasons of the year, with the general understanding that conditions in polar regions are cold and variable, while those in equatorial regions are warm and equable.

These general conditions for the growth of crops are summed up as *climate*. Each station has its own climate, though

stations may be associated one with another as having somewhat similar climates, equatorial or tropical, temperate, polar, oceanic, insular, continental plateau, plain, valley or mountain, with many possible variants.

Observations and Instruments.—For the expression of the climate of a station on a scientific or comparable basis, use is made of meteorological observations, duration of sunshine, sometimes intensity of sunshine, temperature, rainfall, humidity depending on the vapour of water which the air carries, wind and weather. The observations are arranged according to an organized plan drawn up by international co-operation. The temperature of the soil is also included within the scheme of observations for agriculture.

The pressure of the atmosphere as indicated by the reading of the barometer is of great importance in the meteorological programme as bringing the observing stations into relation with the general scheme of atmospheric circulation and consequently with the sequence of weather; but it has no direct influence, so far as we know, upon plants and their growth. Its relation to weather is sufficient justification for its use by the agriculturist, or by anyone else who has business relations with weather. The meteorology of the barometer is not specially agricultural.

Equipment.—The standard instruments for an agricultural station are (1) a sunshine recorder; (2) a set of four thermometers, exposed in a screen to give the temperature of the air at about four feet above the ground—a dry bulb, with a wet bulb to disclose the condition of the air as regards humidity, a maximum and a minimum thermometer; (3) a separate minimum thermometer to be exposed on the grass, sometimes also a solar maximum to indicate unofficially the intensity of sunshine; (4) two or three thermometers to tell the temperature in the soil at 4 in., 8 in., 2 ft.; (5) a rain-gauge to give a daily measure of the fall of rain, which, in less favoured countries, is often supplemented by an evaporation gauge or tank to measure the loss, as the rain-gauge measures the gain. Special instruments for observing winds and clouds are not regarded as indispensable.

The crops' response to the climate is of course their reaction to every phase of the sequence of weather, day in and day out, and when the expense is not prohibitive the ideal equipment of a station would be the sunshine recorder, as before, a portable thermograph for temperature, a hygrograph for humidity. With these may be included a self-recording rain-

gauge with some form of evaporimeter. There should be some contrivance for enabling the observer to estimate the direction and force of the wind—probably a long streamer on the top of a flag pole—something on the lines of the long stocking one sees at an aerodrome might be brought into use; but the established practice is to estimate the wind by its behaviour towards obstacles in its path, a wind-vane on a tower or spire for direction, and trees, water or dusty roads for its force. Sufficient information about clouds as we have said can be effected without special instruments, but for his own information and guidance anyone in charge of an agricultural meteorological station would certainly want a barometer and probably a barograph.

It must always be remembered, however, that self-recording instruments, depending on the behaviour of clocks and other mechanism, cannot be trusted to keep themselves in proper going order without regular attention. They need checking regularly by independent observation of temperature, including humidity (for which a daily reading of temperatures at a fixed hour is perhaps sufficient) and of rainfall in a standard gauge.

The orientation of the wind-vane sometimes requires consideration, as vanes are often set erroneously by magnetic compass.

The Controlling Influence of Temperature.—It will be apparent that temperature is the most vital consideration in agricultural meteorology, not only on account of the immediate influence of the warmth of the air or the soil, but also for its associated influences.

The text-books of elementary physics explain that temperature is intended to tell us how hot or how cold the air or the soil is, and that heat flows from a body of high temperature to one of lower temperature in contact with it; but temperature has a much greater story than that to tell. It is the regular announcer of the behaviour of that mysterious form of energy which we call heat. It tells us that water will go solid and turn to ice if there is not enough temperature in the air to keep it liquid, and will turn into steam if there is too much of it. It tells us, in that connexion, how much water the air can hold in the form of vapour and so it regulates evaporation and condensation. The whole subject of humidity belongs to temperature.

It tells us how much of the heat of a solid body will be transformed into radiation, another mysterious form of energy,

if the body is surrounded by a transparent medium ; and air is sometimes nearly perfectly transparent. So all the conditions of the supply of heat from the sun and the cooling of the ground, as well as the water-vapour in the air, belong to temperature as part of the great subject of radiation with all its intricacies. No two bodies on the earth's surface, alive or dead, can be brought within seeing distance of each other without commencing an exchange of energy by radiation between them, and temperature regulates the exchange.

Observations of radiation, important as this is to the whole world, are only represented inadequately in regular practice by a grass minimum and a solar maximum thermometer. We are waiting for developments in that subject.

Scales for Measuring Temperature, Water-Vapour and Radiation.—Those who are interested in the study of the relation of weather and crops will need always to bear in mind the way in which temperature limits the amount of water-vapour in the atmosphere or provides for its increase. Wherever a scale of temperature is inscribed on a thermometer, or on a form used in a thermograph, scales showing the maximum capacity of air for water in the form of vapour can be placed alongside and it would be well to have such scales in readiness alongside the graduations of temperature. Here is the place to remark that there are many scales of temperature—Fahrenheit, Centigrade, absolute, and the close approximation to absolute which has been called “tercentesimal,” and many modes of expressing the capacity of air for carrying water in the form of vapour—its pressure in inches or millimetres of mercury or in millibars, the dynamical unit of pressure, with the thickness of water in centimetres as an approximate equivalent, or as density in grammes per cubic metre, which is the same as metric tons per cubic dekametre, or grains per cubic foot, or English tons per cubic rod of $5\frac{1}{2}$ yards. These quantities are all set out for comparison in the accompanying table (p. 729).

Some word of explanation is perhaps desirable about the inclusion of the Kelvin-kilograd scale in the company of thermometer scales already numerous, when so far as I know its use is confined to its author. It was devised by Alexander McAdie, Director of the Observatory at Blue Hill, Massachusetts, and Professor of Meteorology in Harvard University, and is included because it seems to be the most “intelligent” of the many methods of measuring temperature. It recognizes the inference of modern thermodynamics under Lord Kelvin's

guidance that there is an absolute zero of temperature, whatever that may ultimately turn out to mean, somewhere near 273 degrees of the Centigrade thermometer or 500 degrees of the Fahrenheit thermometer below the freezing point of water. From that zero all such features of the effect of temperature as the expansion of gases like air, the pressure of water vapour and the radiation of a black body, have to be reckoned. At that zero the whole physical nature of the world changes.

At the same time for many practical and domestic purposes the freezing-point of water is as important to be aware of as the absolute zero. It is well marked as zero in the Centigrade thermometer. McAdie's scale serves both purposes, dating originally from the absolute zero and noting the freezing-point of water as 1,000; at the same time its scale has a very convenient step of about one-half a Fahrenheit degree, not far from a quarter of the Centigrade degree; and a whole step is of the proper order of accuracy of measurement for meteorological work without any decimal fraction.

Actually the absolute zero depends on inferences from experimental work which is always liable to small errors. My own practice has been to use the scale that corresponds with the thermal expansion of air or hydrogen over the range of meteorological temperatures and is made sufficiently near to the absolute scale by adding 273 to the Centigrade reading. To avoid misunderstanding I have called the scale tercentesimal and used t for its symbol without a degree sign because I want to retain the idea of temperature as a physical quantity and not simply an arbitrary index of the direction of flow of heat. If I had my time over again I should try to use McAdie's suggestion.

Change of unit is of course inconvenient at the outset, but it is easy to exaggerate present inconvenience and thereby store up additional inconvenience for the future for which we must contemplate common units of a systematic character. The people who resisted the change from the Julian to the Gregorian calendar for 200 years did not really make things easier for the world.

Records and Summaries.—From this digression on the number of subsidiary businesses in which temperature holds all the shares, let us return to the expression of weather for the study of its influence on crops. We have explained that we have to take account of the reaction between the plant and the sequence of weather as represented on recording instruments.

TEMPERATURE AND CORRESPONDING WATER-VAPOUR AND LONG WAVE RADIATION FROM A BLACK BODY

Pressure and Density of Water-Vapour in English and Continental Units

D	D	T	P	T	T	P	T	T	P	T	D	T	M	R
tons	grs	°F.	inch	°C.	Hg	mm	ut	A	mb	tt	g/m ³	kk	g/kg	hrly.B.T.U. (10m) ³
-43	14.9	90	1.423	32.2	36.2		305.2	305.3	48.2	305.2	34.1	1,119	30.8	49.6
-37	12.9	85	1.214	29.4	30.8		302.4	302.5	41.1	302.4	29.5	1,108	26.0	47.9
-32	11.1	80	1.033	26.7	26.3		299.7	299.8	35.0	299.7	25.4	1,098	21.9	46.1
-27	9.5	75	.877	23.9	22.3		296.9	297.0	29.7	296.9	21.7	1,088	18.7	44.4
-23	8.1	70	.741	21.1	18.8		294.1	294.2	25.1	294.1	18.5	1,078	15.7	42.6
-20	6.9	65	.623	18.3	15.8		291.3	291.4	21.1	291.3	15.8	1,067	13.1	41.1
-17	5.8	60	.523	15.6	13.3		288.6	288.7	17.7	288.6	13.3	1,057	10.9	39.6
-14	4.9	55	.437	12.8	11.1		285.8	285.9	14.8	285.8	11.2	1,047	9.1	38.1
-12	4.1	50	.363	10.0	9.2		283.0	283.1	12.3	283.0	9.4	1,037	7.6	36.6
-10	3.4	45	.301	7.2	7.7		280.2	280.3	10.2	280.2	7.8	1,027	6.3	35.2
-08	2.9	40	.248	4.4	6.3		277.4	277.5	8.4	277.4	6.6	1,017	5.2	33.9
-07	2.4	35	.204	1.7	5.2		274.7	274.8	6.9	274.7	5.5	1,006	4.3	32.6
-06	2.1	32	.180	0.0	4.6		273.0	273.1	6.1	273.0	4.8	1,000	3.8	31.8
-05	1.9	30	.165	-1.1	4.2		271.9	272.0	5.6	271.9	4.3	996	3.4	31.3
-04	1.6	25	.130	-3.9	3.3		269.1	269.2	4.4	269.1	3.7	986	2.7	30.0
-03	1.2	20	.103	-6.7	2.6		266.3	266.4	3.5	266.3	2.7	978	2.2	28.7
-03	1.0	15	.083	-9.4	2.1		263.6	263.7	2.8	263.6	2.3	965	1.8	27.5
-02	.8	10	.065	-12.2	1.7		260.8	260.9	2.2	260.8	1.8	955	1.4	26.4
-02	.6	5	.050	-15.0	1.3		258.0	258.1	1.7	258.0	1.4	945	1.0	25.3
-01	.5	0	.038	-17.8	1.0		255.2	255.3	1.3	255.2	1.1	935	0.8	24.2

T Temperature in degrees Fahrenheit °F.

	in degrees Centigrade	..	°C.
	in degrees Centigrade	..	°C.
	in degrees Centigrade	..	°C.

P Pressure of water-vapour in inches of standard
in degrees Centigrade from -213 ..

mercury	..	..	..	..	..	inch Hg
Pressure in millimeters of mercury						

D Density of water-vapour in thousandths of a ton

per cubic rod (pole or perch), English units.. tons

Polym. 100, 1

	in grains per cubic foot	grs./ft. ³
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Let us suppose that the daily round provides a reading of temperature at 9 a.m., dry and wet bulbs with maximum and minimum of the past twenty-four hours, associated observations of wind and weather and a measure of the rainfall and the sunshine. Afternoon is a better time for wind-observation than early morning because the radiation from the ground, in the absence of the overpowering sun, cools the surface-layer and actually waylays it; so that it fails to keep its place in the air-current which brought it. It leaves up aloft what we may call the real wind to which it belonged. In the afternoon, when the sun has had its chance to act as policeman, that interference with the general business of the air is less likely.

For the purposes of record these daily observations can be tabulated and preserved for reference and subsequently summarized for the week, the month, the season or the year, and ultimately for the sequence of the seasons represented by the means of each day, week, etc., for a series of years.

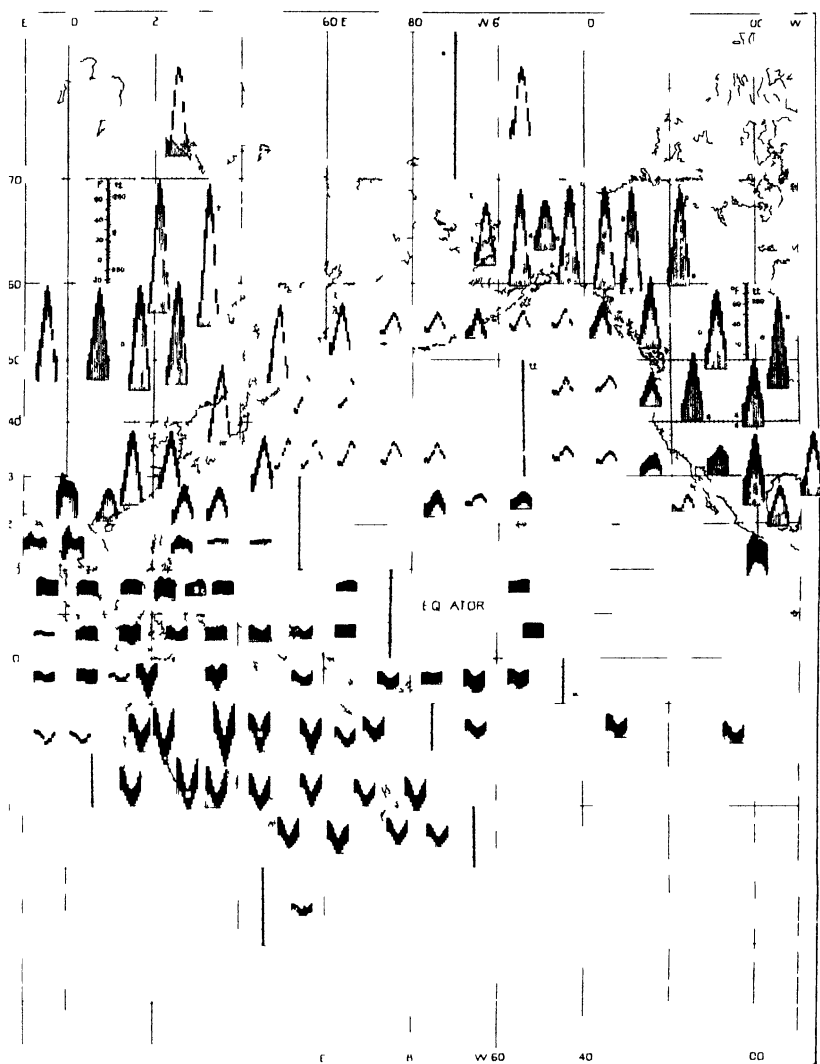
Temperature and rainfall can be "accumulated" or aggregated for the season or the year, the former by computing the duration and extent of the excess of temperature above 42°F. , and the latter by the equivalent depth of water.

When the values have been thus summarized for a series of years, 10 years, 20 years, or 35 years, which earn the title of normals for the station, the summary is an expression of the climate of the station in terms of mean values and extremes for the day, the week, the season or the year, with the amount of rain, the frequency of its occurrence as well as those of cloud, fog, winds of different strengths and direction and so on.

These mean values for a series of years will certainly show a certain rhythm, for example, a daily rhythm of temperature between a mean minimum and a mean maximum, and a seasonal rhythm of maximum and minimum temperature for the day. There may be also a daily rhythm of wind-force, and possibly a corresponding seasonal rhythm. There will probably be no daily rhythm of humidity as expressed by the dew-point, but there will be a seasonal rhythm. There will be a seasonal rhythm of rainfall provided only that the observations are grouped into weeks or months and a considerable number of years are summarized. Pressure would certainly show an interesting half-daily rhythm of small range, and a seasonal rhythm also of small range. The important changes of pressure associated with the travel of cyclonic depressions and anticyclones, so important in forecasts, show no

FIG. 1. PACIFIC HEMISPHERE

TEMPERATURES OF THE DAY AND OF THE NIGHT



Monthly normals of maximum and minimum temperatures at 198 stations on land and 40 five degree squares at sea

FIG. 1. ATLANTIC HEMISPHERE

A GUIDE TO THE CHOICE OF A HOME

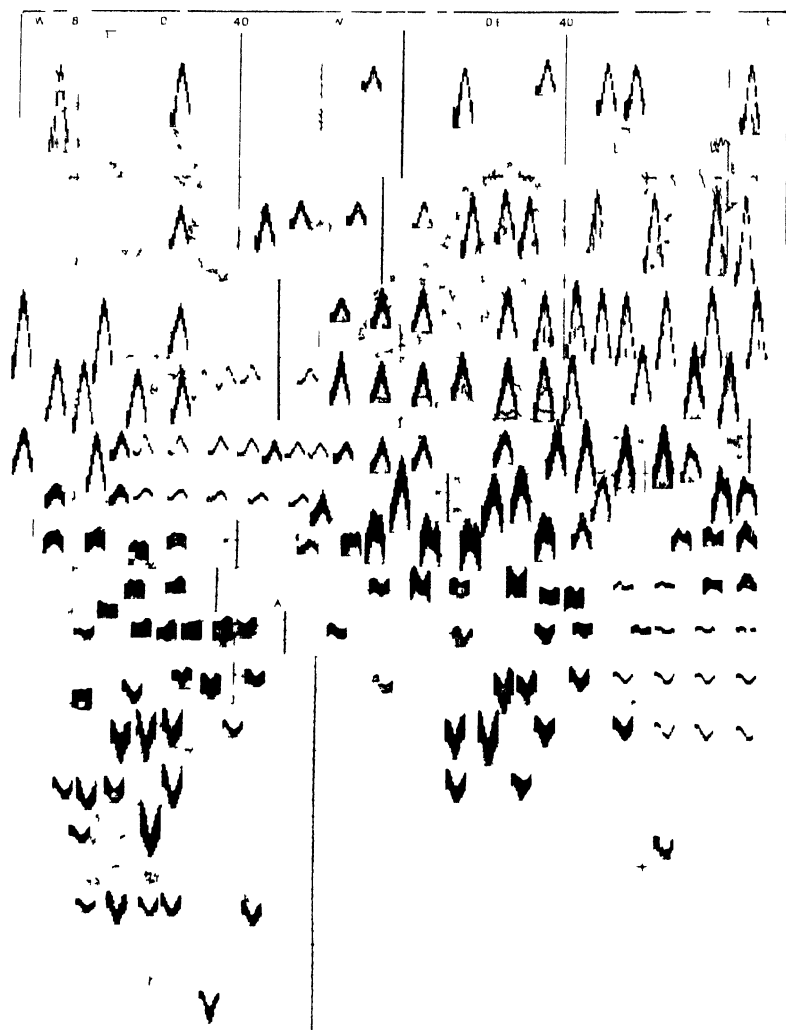


Diagram illustrating the distribution of the Atlantic Hemisphere, showing the relationship between the Atlantic Ocean and the surrounding landmasses. The diagram is divided into two main sections, labeled 'A' and 'B', which represent different geographical regions. The symbols and patterns within the diagram likely represent specific data points or geographical features related to the Atlantic Hemisphere.

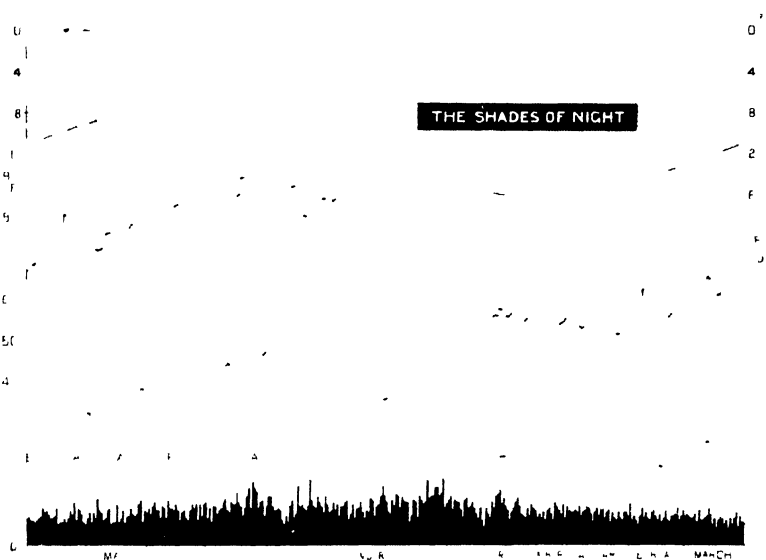


FIG. 2. The daily mean maximum and minimum temperatures at Kew Observatory with the extremes recorded for each day in the 30 years 1871-1900, and a curve showing the length of the day. Between the lines of maximum and minimum horizontal lines indicate 11 steps of 2° below of temperature, and the tops of 10 degrees are marked.

Also the average rainfall for each day of the year in the London district in the century 1829 to 1928.

NOTE.—For permission to reproduce the four diagrams in this set (taken from a work in preparation for publication) the Ministry desires to acknowledge the courtesy of the Cambridge University Press.

recognizable rhythm. Wind may show some rhythmic tendency, but the chief characteristics of the climate of a station are the diurnal and seasonal rhythm of temperature. Every station in the world and every area of sea shows this characteristic for the variations in the temperature of the air. The normal monthly results for about 200 stations on land and 40 at sea are shown in a diagram as "A Guide to the Choice of a Home." (Fig. 1.)

Some Leading Questions.—For the crops of any district it is these seasonal and diurnal rhythms that decide the character of the growth and prosperity of the local produce provided that there is always a sufficient supply of water; and now let us put some leading questions for agricultural meteorology:—

Is the sequence of weather indicated by the normal rhythm of climate *exactly* the sequence of weather required for the normal crop?

What deviations from the normal rhythm should we look for in order to secure a maximum crop, and what deviations should we regard as unfavourable for the crop?

Those are questions that observations in connexion with agricultural meteorology have to some extent answered for some localities in the past and may be expected to answer more effectively in the future.

The interest in the subject in its present form may be said to date from 1903 when attention was called to a curious relation between the yield of wheat in Eastern England, as estimated by the Board of Agriculture at that time, and the district rainfall of the previous autumn. At the same time a suggestion was also made that cold summers were favourable for the barley crop. The question was taken up for a series of crops in Eastern England, and more recently the relation to rainfall of the yield of wheat at Rothamsted has been scrupulously investigated.

Investigations of the relations of other crops to weather have been carried out in many countries, especially in Russia, Sweden, Canada and the United States.

It will, of course, be understood that each crop may have its own "optimum" sequence of weather. What is good for corn is not necessarily good for roots; and, moreover, what is true for a crop in one district is not likely to be exactly true for the same crop in another district. When all is said and done, to ascertain the influence of weather there remains the fact that a growing plant is alive and its success may depend upon something that corresponds with vitamins for animal life. Still we are more likely to form a useful

judgment about that when the general influence of weather on crops is known. The weather is certainly potent for failure if not for success.

The Rhythms and the Facts.—A general line of investigation may perhaps be set out. We have seen that if we are dealing with mean values for a long series of years the sequence within the day and through the year will be rhythmic. For the daily maximum or minimum temperature the rhythm for 30 years as set out in a publication of the Meteorological Office is singularly nearly perfect. (Fig. 2.) Daily rainfall is not so, even with a hundred years to go upon; but let us look at the facts from which the rhythm has been evolved.

Let us imagine a diagram on squared paper upon which a column one millimetre in width, from left to right, is allowed for the salient happenings of each day. Fifteen inches of width would provide for a year, and we will take the year from April, 1928, to March, 1929, as an example.

Let us set out within the millimetre space on a scale of temperature up and down the paper the actual minimum and maximum temperature for each day. Below the temperature scale let there be a similar scale for dew-point for each day, maximum and minimum if possible, if not a reading at a fixed hour; and below that again a block- or step-diagram giving each day's rainfall. Above it let there be a corresponding diagram expressing each day's sunshine and the length of the day, and at the head of all an indication of the wind-direction and its strength, say at noon or 3 p.m., or some other mid-day hour of each day. The noon observation is shown in the diagram.

Following these directions (more or less) a diagram has been constructed for the year referred to and Fig. 3 shows that the whole is still legible (with the aid of a reading glass) when the information for the year is condensed into a space less than a page of ordinary print.

The combination will certainly suggest the rhythm which is so clearly exhibited in the summary of the data for 30 years, but obviously it is interrupted by cold-spells and warm-spells. On some days temperature will range over 20 or 30 degrees, on others over less than five. So what we have in actuality may be described as a rhythm with many interruptions or "intrusions."

The one thing that we can be sure about is that the rhythm of 30 years, dignified by the title of "normal," has, actually, never been recorded. A year's experience is never repeated;

two consecutive years are never exactly alike. When we compute the rhythm of mean values we know that it never was and never will be on land or sea.

We may put our leading question in another form, namely, What is the salient influence in the growth of crops?—is it the near approximation that the year makes to the normal rhythm, or the good fortune of the favourable intrusions and the avoidance of unfavourable ones?

The Agriculturist's Opportunity.—These are the questions that observation and nothing else can answer. The problem presented is truly an observational one. We may have our views of what makes or mars a crop, but there is no substitute for the juxtaposition of organized observation of weather with organized observation of crops. The observations of weather are already organized, and the organization can be adjusted as the requirements of the problem become explicit. The observations of the growth and prosperity of the crops need organizing. The meteorologists have provided numerical codes for the direction of the wind and its force, for visibility, for the state of the sky, the weather and the ground. Can the agriculturists provide a numerical code for the result of, say, a weekly inspection of the crop by a competent judge of its behaviour?

The pertinent observations are not necessarily limited to the particular periods of a crop's growth. Mischief may have been done by the weather in the development of the seed; and any *a priori* ratiocination may result in the concealment of a relation that would have been detected if the facts, and nothing but the facts, had been in juxtaposition.

It is with the view of explaining the methods of pertinent observation for the purposes indicated that the Committee on Agricultural Meteorology at the request of the Conference of Meteorologists of the Empire has under consideration a syllabus that will suggest a mode of procedure adaptable to the requirements of the various countries of the British Commonwealth.

THE ENGLISH FRUIT AND VEGETABLE CANNING INDUSTRY

SINCE the days before the Great War, there has been a great change in the public taste for canned goods. Both in restaurants and in the household the consumption of canned fruits in this country has very greatly increased. This will be realized when the figure of 850,000 cwt. is contrasted with a figure of $3\frac{1}{2}$ million cwt., the approximate quantities consumed in 1913 and 1931 respectively. In 1913, the share of the English canneries in this consumption was negligible. To-day, it amounts to something in the neighbourhood of half a million cwt. This progress is striking, but still, out of every seven cans opened in this country, only one contains home produce. What then are the prospects of the English canning industry?

It must be appreciated that of the imports the great bulk is made up of peaches, pears and pineapples, the only other canned fruit imported in any quantity being apricots. These four total between them nearly $2\frac{1}{2}$ million cwt., or over 80 per cent. of the imports. Taking into account also other fruits not grown in this country for canning purposes, including fruit salad largely composed of peaches, pears and apricots, there remain about 4 per cent. of the imports—fruits such as loganberries, cherries and plums—that compete directly with canned English fruits. It is, therefore, true to say that our canners, by their energy and enterprise, have largely created the market for the fruits that are grown in this country, and, provided that high quality of product is maintained, there is no reason to suppose that the rapid progress made in the last five or six years will be checked. It is at least safe to assume that canned English fruits will share in any further expansion of the demand for canned fruits as a whole, and may quite well increase their present proportion of one-seventh of the total consumption.

The rapid development of the English fruit-canning industry has been accompanied by equally striking improvements in canning technique. Our canners have not aimed at a boom popularity, but have striven to establish confidence in the quality of their products, bearing in mind that inefficiency on the part of a few might damage the whole prestige of the recently developed industry. With the object of building up a reputation based on quality, most of the canners have co-operated in various ways—by interchange of technical advice and assistance, by giving financial support towards

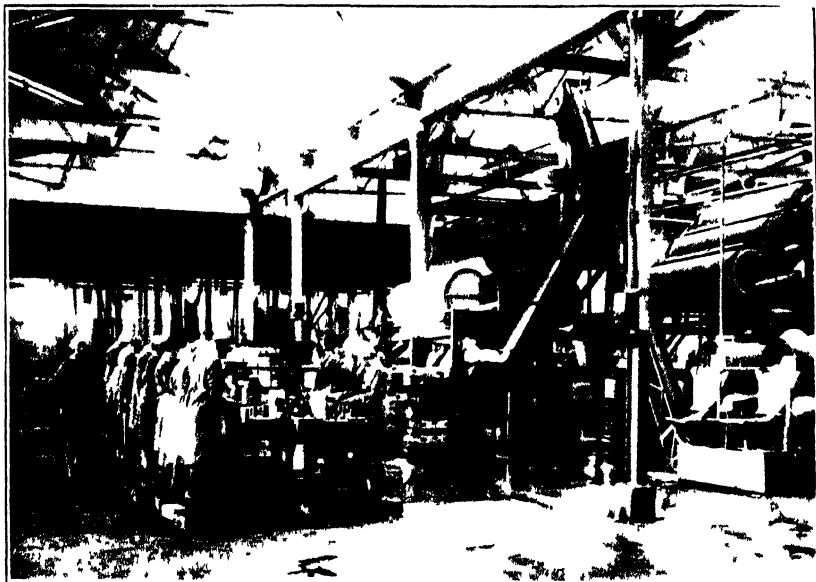


FIG. 1. Girls filling on with trawberns at the factory of Wished Produce Co. Ltd. Spilling. The cylindrical machines on the right of the view are peewebbers.

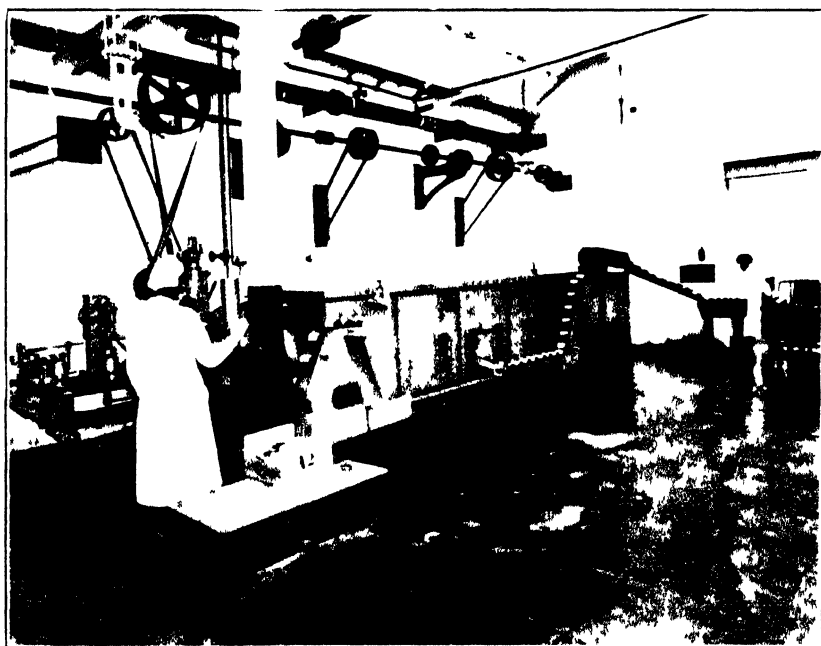


FIG. 2. British-made spinning unit at the Factory of the Co-operative Wholesale Society Ltd. Cleve-Reading.

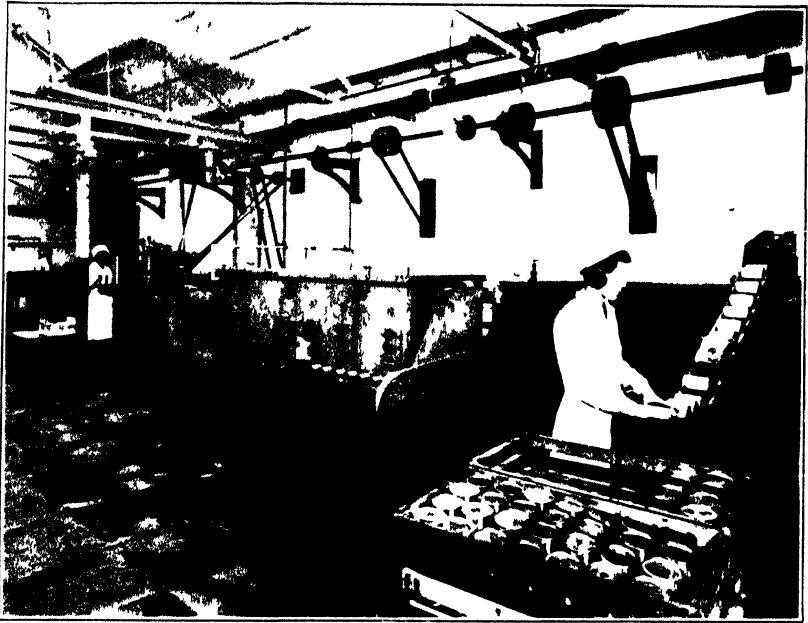


FIG. 3. Another view of the British-made canning unit, FERRY, of the Co-operative Wholesale.

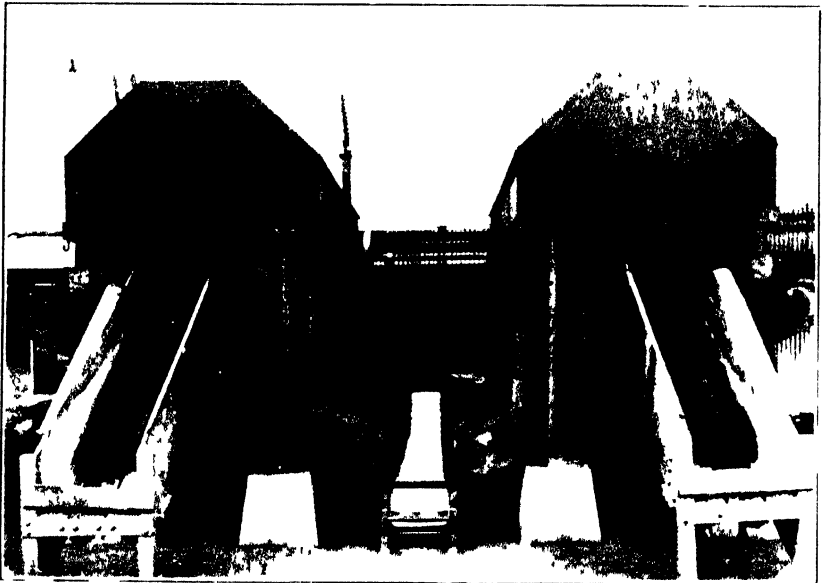


FIG. 4. British-made polymers at the factory of Joseph Farrow & Co. Ltd., Peterborough.

the maintenance of the extremely valuable research and testing work carried on at the Campden Fruit and Vegetable Preservation Research Station, and by adopting the principles of standardization involved in canning to the standards of the National Mark Scheme.

The Canning Factories.—The number of fruit- and vegetable-canning factories in England and Wales has increased from 30 in 1928, to 40 in 1930, 56 in 1931, and 68 in 1932. Of these, 53 factories operated by 41 firms are authorized for canning under the National Mark. The canners require their raw material in large quantities and in perfect condition. It is natural, therefore, that most of the factories should be concentrated in or near the main growing areas: (a) Kent and Middlesex, including the London area; (b) The Wisbech area; (c) The South Lincolnshire pea-growing area; and (d) Worcestershire and Herefordshire.

Other canneries draw from local supplies, but a few that are situated some distance from the source of their supplies are at some disadvantage because special transport arrangements are necessary to ensure that the fruit arrives as soon as possible after picking. Factories so placed are usually able to complete the canning of fruit within 24 hours of picking, but if for any reason deliveries are delayed or crushed in transit they must be used for jam-making or pulping. Certain canneries undertake jam-making in addition to canning, and are thus able to dispose immediately of any fruit that is not of the requisite standard for canning or bottling. Others pulp such fruit and sell it to jam manufacturers.

The kinds of fruit canned in this country embrace tree fruits (plums, damsons, cherries and apples), and berry fruits (strawberries, raspberries, loganberries, blackberries, gooseberries, blackcurrants and redcurrants). The pea is by far the most important vegetable, but beans, carrots, celery, new potatoes, turnips, spinach and beetroots are also canned. The vegetables and soft fruits grown for the fresh fruit and vegetable market are not all of them suitable for canning. Much valuable information with regard to the particular varieties of each kind of fruit and vegetable most suitable for canning purposes is contained in one of the Ministry's Bulletins.*

* Bulletin No. 45: *Fruit and Vegetable Production for Commercial Canning*. H.M. Stationery Office, price 1s. 3d. net (1s. 5d. post free).

Canning Operations.—(a) *Fruit*.—It is no uncommon thing for a large consignment of fruit to be canned and put into store within an hour of delivery at the factory. Immediately after arrival at the receiving room the fresh fruit undergoes a preliminary examination and check weighing. It then receives the “snibbing,” “strigging” or other preparation appropriate to the variety of fruit, before being graded, sorted, washed and filled into cans.

Grading has two aims, viz., to ensure uniformity of (a) quality and (b) size in the can. Quality must be determined by the eye, but machines may be employed for sizing. In a number of factories, grading for both quality and size is done in one operation by girls who sort the fruit on stationary trays. In others, moving belts are used from which one gang of women removes fruit of poor quality while another gang, lower down the line, grades for size. At yet other factories, however, grading for quality is performed on moving belts, but sizing is carried out by mechanical methods, a number of which are undergoing exhaustive tests. Fig. 1 shows girls filling cans with strawberries at the National Mark canning factory of Messrs. Wisbech Produce Cannery, Ltd., Spalding.

After filling, the cans pass to the canning unit for five consecutive operations: (1) filling with syrup, (2) exhausting, (3) seaming, (4) cooking, and (5) cooling. The sugar for syrups is obtained chiefly from beet-sugar factories operating within easy distance of the canneries, and is either home-grown beet sugar or British refined sugar. Figs. 2 and 3 illustrate, from two different angles, a canning unit in use at the Co-operative Wholesale Society's National Mark canning factory at Coley, Reading. This unit is a compact British-made plant, capable of turning out 36,000 cans per day.

In order that a thorough impregnation of syrup may be effected and that possible faults as a result of imperfect seaming and/or sterilization may have time to show themselves, the finished article remains in store for a period before being labelled ready for dispatch.

(b) *Peas*.—Peas are either picked from the vine in the field and dispatched in bags to be “podded” at the factory or the vine is mown or pulled and complete plants are conveyed loose to the factory to be “vined.” At least one factory has installed additional viners at depots in the area of collection—a method that reduces transport costs and assists in the ready disposal of haulm and empty pods. Fig. 4 illustrates British-made viners in one of the vining sheds at the National



Fig. 5. Gravel Elevator, No. 1. Elevator No. 2 is in front with four 12WEL 14H 14Cours 14L Spdlin

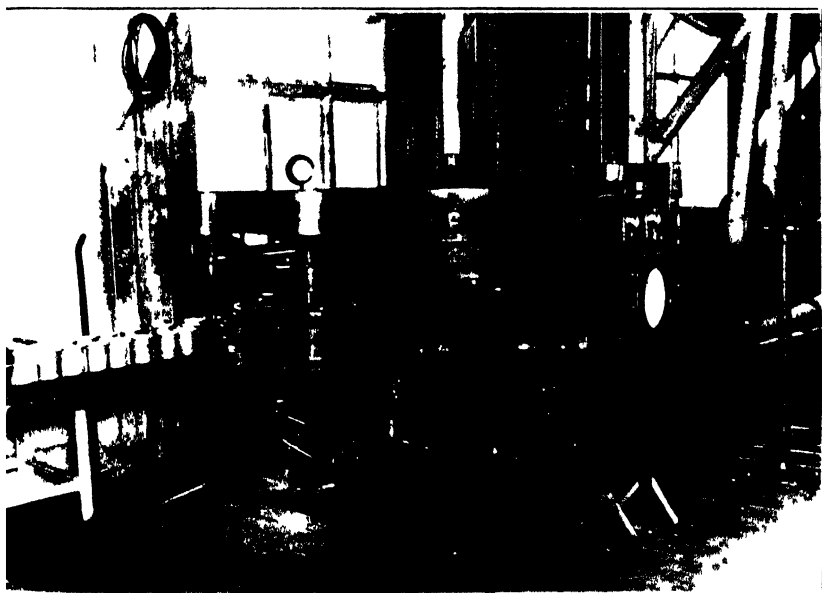


Fig. 6. Conduit for 14L 14Cours 14L Spdlin w 14Cours 14L Spdlin

Mark canning factory of Messrs. Joseph Farrow & Co., Ltd., Peterborough. The peas are winnowed, washed, size-graded and passed through hot-water blanchers, sprayed, and hand picked for defective peas on travelling belts which pass before several pairs of sharp eyes and busy hands. Cans are then filled with due proportions of peas and brine and pass successively through the seaming machine, pressure cooker, cooler, and so on to store. After leaving the seaming machine, the cans are loaded into iron crates and lifted by crane conveyors into pressure cooking retorts. Fig. 5 shows a crate filled with cans being lowered into a retort at the factory of Messrs. Wisbech Produce Cannery, Ltd., Spalding. When the dial shows that the "cook" is completed, the crate is lifted out and ferried along a concrete canal a few inches below the surface of the water. On debarkation the cans are packed into cardboard containers to await labelling and the crates are returned to the seaming machine for refilling.

In one or two factories, a new American pressure-cooker and cooler of a type not previously used in this country has been installed. Fig. 6 shows one of these in use at Messrs. Farrow's Peterborough factory. The cooker and cooler is 19 ft. high, but as it is sunk in a pit 15 ft. deep the illustration only gives a partial view. Cans of peas enter the top of the cooker on a travelling conveyor and descend spirally, the rate of descent being controlled to ensure time being allowed for the requisite "cook." The cans then emerge through a valve into the companion cooler, in which they are cooled by hydrostatic pressure as they gradually ascend on spiral conveyors. Travelling bands then convey them into store. An automatic device indicates every thousandth can, which is taken out for testing.

(c) *Other Vegetables*.—Other vegetables, such as stringless beans, beetroots, young carrots, celery, new potatoes, spinach and turnips require individual methods of treatment, but the differences relate mainly to operations before the filling of the cans. Careful selection of raw material, effective sterilization and efficient seaming are the main considerations in the successful canning of all kinds of produce.

Conclusion.—In the development of the industry, more has been involved than the actual operations of canning. To ensure that progress may be continuous and not subjected to checks, some of the vitality of the new industry had necessarily to be transfused into its auxiliary and ancillary

trades. Growers who had hitherto found outlets only in the fresh-fruit market and jam factories, and who showed caution before embarking on the production of fruits and vegetables of the standards and types required for canning, had to be reassured. Pea crops lend themselves readily to growing on contract. It is now the general rule for pea contracts to be made early in the year, seed being supplied by the canner to the grower at cost price, which is deducted at the time of settlement. The contracts stipulate for the yield of a certain number of acres subject to satisfactory condition, and payment is made on the weight of peas after being threshed. The extension of contract-growing to fruits and other vegetables has long been recognized by both canners and growers as a desirable development. Conferences held a short time ago between a Sub-Committee of the National Food Canning Council and representatives of the National Farmers' Union, at which forms of contract were agreed upon, should give an impetus to large-scale cultivation of the particular varieties of fruit and vegetables most suitable for canning. The engineering trade have recognized that it is to their advantage to apply their inventive genius to the new industry, and suitable British-made machinery is now readily available. Can-makers also were quick to realize the possibilities, and by the erection of factories such as those at Worcester and Acton, capable of turning out 1,200 and 800 cans a minute, respectively, have fully kept pace with the expansion. In the main, cans are obtained from one or other of the firms specializing in can-making.

So far, little has been done to develop the export of canned English fruits and vegetables, owing to the comparative ease with which the home demand has absorbed the available output, but consignments, particularly of peas, new potatoes, strawberries, gooseberries and plums, have been dispatched to many parts of the world, notably to India, Malaya, and East and West Africa. There is undoubtedly a big potential market in these and other parts of the Empire for the products of English canneries, which the growth of inter-Imperial trade should develop, as well as in some foreign countries. Existing experience indicates that standardization is essential for export business, and the canning industry has ready to hand in the National Mark Scheme an adequate standard that the majority of canners has already adopted, and upon which the exploitation of these overseas markets may be profitably based.

REPORT ON THE WORK OF THE EDUCATION AND RESEARCH DIVISION OF THE MINISTRY FOR THE YEAR 1930-31*

PART III.—HORTICULTURE

THIS section of the Report deals with the work of the Horticulture Branch of the Ministry, which includes the administration of the Destructive Insects and Pests Acts, 1877 to 1927, the arrangements for the issue of the various "health certificates" required by the regulations of the importing countries to accompany agricultural and horticultural produce exported from this country, business connected with horticultural education and instruction in bee-keeping, the preparation and revision of Bulletins and Advisory Leaflets on horticulture and allied subjects, the administration of the various schemes for the inspection and certification for purity of growing crops of potatoes, strawberry plants and black currant bushes, and the business of the Minister's Horticultural Advisory Council.

General.—Reference has been made in the preceding sections of the Report to the effect of the financial crisis on the development of education and research, and nothing further need be said here. Two other subjects of major importance, however, merit special mention—the imposition of emergency Customs duties on certain categories of horticultural produce, and the enhanced danger of the introduction of the Colorado Beetle into this country. (This latter topic is dealt with later in the note on the administration of the Destructive Insects and Pests Acts.)

Horticultural Products (Emergency Customs Duties) Act, 1931.—This Act empowered the Minister to make Orders charging Customs duties on certain categories of fresh fruits, fresh vegetables and flowers, "the production of which in the United Kingdom can be increased, or which are articles of luxury." The levying of such duties raised entirely new questions which obviously demanded careful consideration. The various interests represented on the Minister's Horticultural Advisory Council—growers, wholesalers and retailers—who had passed a resolution welcoming the measure as a recognition by the Government of the potentialities for the correction of the balance of trade which were offered by certain luxury or "non-essential" fruits, flowers, vegetables and other horticultural products—were accordingly invited to form

* Continued from p. 627 of the issue of this JOURNAL for October, 1932.

panels (including persons who, though not members of the Council, were possessed of special knowledge of the particular subject) to consult with the Ministry, the Department of Agriculture for Scotland, and the Ministry of Agriculture for Northern Ireland on the proposed Orders. Conferences were held at which the views of the various interests concerned were fully explored; these conferences dealt with vegetables, flowers, bulbs, glasshouse produce, fruit and tomatoes. Naturally among such divergent interests unanimity was not to be expected, but a gratifying measure of agreement was reached in many cases, and the information so obtained was extensively used and proved of the utmost value in the framing of the Orders.

It may be mentioned here that measures were at once taken to advise and assist growers in cultivating crops of the various commodities the importation of which, it might be anticipated, would be materially reduced by the imposition of Customs duties. The Ministry's Horticulture Commissioner addressed meetings in various parts of the country and explained to growers the nature of the duties, the extent of the previous importation of the various commodities, and the opportunity now afforded of replacing imports by home-grown produce. It is a truism that, even with the measure of protection afforded by the duties imposed under the various Orders, foreign competition can only be met by the adoption of the most up-to-date methods, and the cultivation of the varieties most acceptable to the market.

To meet the immediate demand for information and advice, the technical officers of the Ministry proceeded to prepare a series of Bulletins, each devoted to some special crop, or group of crops. Among the Bulletins issued since December, 1931, may be mentioned those on Narcissus Culture, Fruit and Vegetable Production for Commercial Canning, Intensive Apple Culture, Celery Growing, Cabbages and related Green Crops, and Salad Crops. The sales of the Bulletins indicate a keen demand for information of this specialized nature, and show that the industry is taking advantage of the opportunities afforded to it.

Horticultural Education.—Previous Reports have dealt exhaustively with the facilities provided by county education authorities in the way of advice and instruction on horticultural matters, and have given examples of the nature of the work carried on by the horticultural staffs employed by

those bodies. It is not proposed to give further examples here, and it will suffice to say that the time and energies of these county officers continue to be very fully employed in complying with the requests made for personal visits and advice on the manifold problems with which the modern grower is confronted, with correspondence on similar matters, and with the arrangement and supervision of the fruit and vegetable demonstration stations under their charge. Incidentally it may be observed that county education authorities fully realize the importance of the opportunities for increased production presented by the change in the fiscal system of the country, and by the rapid development of the industry engaged in the canning of fruit and vegetables.

Crop Reports.—Reports on the condition of fruit, vegetable and flower crops in areas where such crops are grown to an appreciable extent for market have been issued at regular intervals. These reports are based on information supplied by the Horticultural Inspectorate, and during the summer months relate to the chief fruit and vegetable crops; from October to April they are confined to flowers and vegetable crops of seasonal interest. Forecasts of the probable yield of plums, cherries, gooseberries, damsons, strawberries, raspberries, blackcurrants, early cooking apples, and also of Bramley's Seedling, Worcester Pearmain, Cox's Orange Pippin, and cider apples are issued at the appropriate periods of the season.

Inspection of Growing Crops.—The schemes for the inspection and certification of growing crops of potatoes, strawberry plants and blackcurrant bushes were continued during the year. The inspections are made during the growing season by officers of the Ministry's Horticultural Inspectorate who have been specially trained in the identification of the varietal characteristics and disease symptoms of the crops with which they deal. At the close of the inspection seasons registers of the names and addresses of certificate holders are issued. Fees are charged for the services of the Inspectors in order to render the work self-supporting.

Potatoes.—The system of inspection and certification of potatoes was introduced in 1918 to meet the demand for pure stocks of potatoes of varieties immune from Wart Disease. A few years later the scheme was extended to include susceptible varieties of potatoes.

The acreages of approved immune and other varieties of potatoes inspected and certified in each of the last four seasons are given in the table overleaf.

The minimum standard of purity necessary to qualify for a certificate is 99.5 per cent. The acreage which failed to reach this standard

Year	Immune Varieties		Other Varieties	
	Inspected	Certified	Inspected	Certified
1928	5,179	4,640	3,599	3,189
1929	5,074	4,520	3,041	2,736
1930	2,485	2,235	2,273	2,063
1931	2,729	2,309	2,354	1,937

of purity in 1931 represented nearly 15 per cent. of the total area inspected as compared with 10 per cent. and 11 per cent. in 1930 and 1929, respectively.

A few well-known varieties account for the great bulk of the acreage inspected. In the immune section "Majestic" with 36 per cent., "Great Scot" 26 per cent., "Kerr's Pink" 20 per cent., and "Arran Banner" with 8 per cent. together accounted for 2,075 acres (90 per cent.) of the total area of 2,309 acres actually certified. The remaining 234 acres covered some 53 different varieties of immune potatoes.

Over 62 per cent. (1,368 acres) of "King Edward VII" were certified in the susceptible section; followed by "King Edward VII" (Rod Type) with slightly more than 100 acres and "Eclipse" with nearly 100 acres.

Strawberry Plants and Blackcurrant Bushes.—Details of the operation of the schemes for the certification of pure stocks of strawberry plants and blackcurrant bushes were published in the May, 1932, issue of this JOURNAL.

Certified Exports of Plants, Potatoes, etc.—(a) *General.*—The entry of plants, trees, shrubs, etc., and potatoes into the majority of countries is governed by regulations of various kinds, and in all cases where an official certificate is one of the conditions of entry the Ministry arranges for the necessary inspection and certification of produce exported from England and Wales. The certificates required, though differing in details, are usually to the effect that the consignment is believed to be free from pests and diseases; in some cases the freedom from a specified disease or pest of the locality where the plants were grown is required to be certified. Selected members of the Inspectorate carry out the examination of material for export, normally on the premises of the grower or exporter; small consignments of plants or bulbs for export by parcel post, and larger packages weighing not more than 1 cwt., may be sent for examination at the offices of the Ministry. For this service fees are charged on scales calculated to render the work self-supporting.

It is important that exporters shall observe strictly the regulations governing the entry of nursery stock and other produce into countries overseas. This applies not only to the form of certificate prescribed but also to the packing material, since a number of countries have issued regulations either

prohibiting the importation of certain kinds of material or requiring it to be sterilized before use. Failure to comply with these regulations in any respect may lead to delay in delivery or even to the return or destruction of the consignment. The Ministry supplies, on application, the latest information available on these matters.

(b) *Nursery Stock, etc.*—The number of certificates issued in respect of consignments of nursery stock, etc., exported from England and Wales, in each of the last four years, and the total value of the consignments concerned, are as follows:—

	<i>Phylloxera certificates</i>	<i>Health certificates</i>	<i>Value £</i>
1928	971	5,349	65,618
1929	1,104	4,983	78,043
1930	1,292	4,385	68,250
1931	1,009	4,337	49,670

Bulbs (mainly narcissus, lily, iris and tulip) valued at approximately £5,930, manetti stocks valued at £3,900, and orchids to the value of £26,270 were included in the total consignments certified for export in 1931.

As in previous years a larger number of consignments was exported to the United States of America than to any other country, a total of 1,200 certificates being issued by the Ministry, after examination of produce to the value of some £28,400.

Of the 77 other countries to which certified nursery stock, bulbs, etc., were exported from England and Wales in 1931 Canada, Sweden, France, Belgium, Holland and New Zealand were the principal customers.

(c) *Potatoes.*—In the following table are given details of the quantity and value of potatoes certified for export from England and Wales for each of the years 1928-1931:—

	<i>Tons</i>	<i>£</i>
1928	23,313	130,063
1929	58,715	280,015
1930	27,675	121,241
1931	25,949	147,882

Although the quantity of potatoes exported in 1931 was slightly less than in 1930, it will be noted that the value shows an increase, the average price per ton in 1931 being about £5 14s. 0d., compared with £5 12s. 0d. and £4 15s. 0d. respectively in the years 1928 and 1929, and £4 7s. 6d. per ton in 1930.

Spain, with a total of nearly 16,900 tons, was again the largest importer of English potatoes in 1931; exports to Algeria totalled 4,500 tons. The Channel Islands, Canary

Islands, and Portugal were also importers of appreciable quantities.

Destructive Insects and Pests Acts, 1877 to 1927.—These Acts empower the Minister to make Orders for preventing the introduction into this country, or the distribution in the country, of destructive insects and plant diseases. The prevention of the introduction of insect pests and plant diseases hitherto unknown in the country has been justly described as one of the most difficult and responsible problems with which the Ministry is called upon to deal. Orders involving embargoes or restrictions on the entry of imported produce inevitably cause some inconvenience to importers in this country, and may provoke natural resentment among overseas exporters whose business is adversely affected by the regulations. The position of the Ministry cannot be stated otherwise than in the following quotation from the Report of the Education and Research Division for the year 1929-30 :—

“It can only be said that while the Ministry has no desire to hamper international commerce by unnecessary restrictions it is its duty, so far as is possible within the powers conferred on it by Parliament, to preserve the crops of this country from imported pests and diseases.”

Colorado Beetle Orders.—The discovery of the Colorado Beetle in the neighbourhood of Bordeaux in 1922 made it necessary for the Ministry to take precautions against the introduction of the pest into this country through the medium of French potatoes, nursery stock, etc. Regulations that came into force as from December 17, 1923, required all living plants, potatoes and tomatoes imported into this country from French ports to be accompanied by an official certificate to the effect that they were grown more than 40 kilometres from any place where the Colorado Beetle exists or has been known to exist.

During the summer and autumn of 1930, however, rumours that the potato-exporting district of Brittany had become infested gave rise to some apprehension as to the adequacy of the precautions described above. No official information as to the incidence of the Beetle at the end of the 1930 season was available, and the French Ministry of Agriculture were invited to send representatives to London in March, 1931, to discuss the position. They stated that the large number of outbreaks discovered during 1930 was attributable to the increased efficiency of their inspection service rather than to any great extension of the infested area; that the Beetle had not been seen north of the River Loire, and that the most northerly

outbreak was situated some 60 kilometres south of Angers, the centre of the nursery-stock district, and about 200 kilometres south-east of the potato-exporting district. They expressed the hope that in 1931 the further spread of the pest northward would be prevented, and that many of the existing outbreaks would be completely extirpated. After full consideration of the position thus explained, it was decided that the radius of 40 kilometres no longer provided adequate protection, and that it must be increased to 75 kilometres. This decision was embodied in the Colorado Beetle (Amendment) Order of 1931 which came into operation on May 4, 1931.

During the summer of 1931, the Beetle spread in a northerly and easterly direction in six Departments north of the Loire, and one outbreak was actually found within 65 kilometres of the Channel. It was obvious, therefore, that the precautions embodied in the Order issued in May could no longer be regarded as sufficient. The French Ministry of Agriculture was again afforded the opportunity of sending representatives to London and the situation was discussed with them early in October, 1931. After full and careful consideration of their proposals, it was decided that the importation of potatoes grown in any part of France must be entirely prohibited; that nursery stock and living plants could be admitted only if they were officially certified not to have been grown within 200 kilometres of any place where the Colorado Beetle exists or has been known to exist; and that between March 15 and October 14 in each year the admission of raw vegetables, including tomatoes, onions, aubergines and salads, must be subject to the same restrictions. Effect to these decisions was given by the Colorado Beetle Order of 1931, which became operative on March 15, 1932.

In order that every possible step may be taken to ensure that any appearance of the Colorado Beetle in this country shall be promptly notified to the Ministry, Local Authorities, particularly those in the southern part of the country, were asked to arrange that lectures given by their officers during the spring and early summer should include references to the Beetle, and to the necessity of promptly notifying suspected outbreaks. A poster illustrating the appearance of the Beetle in all its stages was prepared, and arrangements made for its display in counties with seaboard or ports with French trade; more than 12,000 copies of this poster have been distributed in addition to some 40,000 copies of the Ministry's leaflet on the pest.

Destructive Insects and Pests Order of 1922.—This Order requires certain classes of plants for propagation, as well as potatoes, onion and leek seed, and gooseberries, imported into England and Wales, to be accompanied by certificates of health issued after inspection by officials of the Plant Protection Service of the country of origin, and prohibits the distribution of uncertified consignments until they have been examined and passed as healthy by an Inspector of the Ministry. In proportion to the large volume of imports the number of cases in which it has been necessary to take action during the year has again been very small and there is no doubt that the existence of this Order has had the effect of maintaining a high standard of health in the imported produce affected by the regulations. The number of health certificates received from all sources during 1931 and the number of uncertified consignments were 55,823 and 442 respectively, as compared with 45,231 and 324 in 1930. The number of certificates is the largest that has been received in any year since the Order has been in force. Once again importations from the Netherlands accounted mainly for the increase, the number of certificates received from that country being approximately 7,000 greater than during the previous year, which, it may be recalled, showed a similar increase over 1929.

Most of the uncertified consignments were found to be healthy and were released after examination. The following list gives examples of the action taken where the health of uncertified consignments was found to be unsatisfactory :—

Canary Islands.—Cacti, Banana plants and "Dragon" trees infested with scale insects. The infested leaves were destroyed and the remainder of the plants suitably disinfected.

Germany.—Rose stocks. A truck load of 150,000 was found to be affected with Rust. The whole consignment was returned to the senders.

Holland.—Potatoes. 164 bags of blighted tubers were sorted out from a consignment of 800 and were re-exported.

Turkey.—Cyclamen and Colchicum bulbs affected with rot. The diseased bulbs were destroyed.

The arrangements made in 1930 for the examination, at various ports, of certified consignments of imported plants, etc., were continued during the autumn and winter of 1931. The inspection of some 500 consignments of various kinds of plants and bulbs from different countries showed that the great majority were generally healthy and in good condition.

As in previous years special attention was given to certified consignments of new potatoes from the Canary Islands, and during the season 20 consignments, comprising 2,857 cases,

were ordered to be destroyed or re-exported by reason of the discovery of tubers infested with the Potato Moth (*Phthorimaea operculella*). Similar action was taken for the same reason in respect of two consignments, comprising 217 cases of potatoes grown in the Malaga district of Spain. The facts were brought to the notice of the Spanish Government, who have stated that orders have been issued to ensure the stricter application of the measures necessary to prevent the exportation of similarly infested consignments to England.

Destructive Insects and Pests (Amendment) Order of 1927.—This Order was issued in November, 1927, following the discovery, during that month, of the Chrysanthemum Midge (*Diarthronomyia hypogaeu*) in certain nurseries and glass-houses in the Lea Valley. Details have been given in previous reports of the measures adopted for the extirpation of the pest and the complete success of these measures may now be claimed, no trace of the Midge having been observed since October 17, 1930, in spite of thorough periodical inspections of nurseries in which the presence of the pest had been confirmed.

This result may be regarded with satisfaction; there have been very few instances, either in this country or abroad, of the complete extirpation of a foreign pest which had established itself in favourable surroundings.

Between November, 1927, and June, 1930, the presence of the Midge was confirmed on twenty premises in all: the last of the restrictions was withdrawn on January 19, 1932.

Importation of Raw Cherries Order of 1931.—The last report* contains (pp. 58-9) an account of the measures adopted in 1930 to prevent the importation of cherries infested with the larvæ of the Cherry Fruit Fly. In that year, it will be remembered, a seriously infested consignment from the French Zone B (21 Central Departments) was intercepted on the same date as that on which the first serious infestations were found in fruit from Zone A (17 Southern Departments). Infestations were also found in consignments from districts from which infested fruit had not hitherto been intercepted. It, therefore, became necessary in the middle of the season of 1930 to issue an amending Order allowing imports to continue until June 24 only instead of until July 6 as provided for in the original Order.

* Report on the work of the Education and Research Division for the year 1929-30.

These facts confirmed the doubts which had been felt for some time by the Ministry as to the justification for any differentiation in the treatment of cherries grown in the various parts of France ; it was accordingly decided that the " Zone " system must be abandoned, and that for 1931 the restrictions must be applied on the same date irrespective of the district in which the fruit was grown. No infested fruit had, however, been found in consignments originating from the small area around Honfleur in favour of which a complete exception had been made in 1929 and 1930, and it was therefore decided that this exception might be continued, but that the entry of cherries from the rest of France must be prohibited after June 2.

Under the Order of 1930 the importation of Italian cherries was prohibited after June 5, with the exception of those certified to have been grown in the Region of Emilia, which were allowed to enter until June 16. As a seriously-infested consignment from that region was intercepted on June 11, it was considered that the extension of time allowed in 1930 was too long, and it was decided for 1931 to prohibit the entry of all Italian cherries after June 10.

In 1930, following the discovery of seriously-infested consignments, the importation of all German cherries was prohibited after July 8. The German Government requested at the time that the prohibition should not extend to fruit grown in the Lower Elbe district, in which, it was stated, the Cherry Fruit Fly had never been found. As the season was then almost over, and as no authoritative information was available, the Ministry was unable to see its way to make the desired concession in 1930. During the early months of 1931, however, the German authorities were able to supply particulars as to the incidence of the pest which appeared to justify an exception in favour of the district in question. It was decided that, while the importation of German cherries generally should be prohibited after June 29, no restrictions should be placed on the entry after that date of cherries certified not to have been grown south of latitude 53° N. or in East Prussia.

These decisions, which were based on the principle of prohibiting importation as from the dates when the arrangements in force in 1930 proved inadequate to prevent the introduction of infested fruit, were embodied in the Importation of Raw Cherries Order of 1931 which was issued on April 23.

Numerous representations were made to the Ministry with

the object of extending the date fixed for the cessation of imports of French cherries ; these representations were based on the allegation that the ripening of the crop was approximately 10 days later than in a normal season. The Ministry's experience during the past five years, however, did not bear out the assumption that the lateness of the season had any appreciable effect on the date on which infested fruit made its appearance on the English market, and the desired concession was refused. When the results of the sampling of imported consignments became available, it was clear that the closing date had not been fixed too early. The sampling began on May 14 ; traces of infestation were found on May 27 ; on May 28, a consignment was found to contain 15 per cent. of infested fruit and on the following day an 8 per cent. infestation was intercepted. Before importations were stopped under the provisions of the Order, further serious infestations were found ranging from 12 to 91 per cent. Of the 53 consignments of French cherries examined during the season, 10 contained infested fruit to the extent of 5 per cent. or over, 11 were slightly infested and 32 were found to be entirely free from infestation.

20 samples of Italian cherries were examined between June 6 and 11. With the exception of one taken on June 10, in which a single maggot was found, all were free from infestation.

The first samples of German cherries were taken on June 27, on which date a seriously infested consignment was detected ; this, however, originated from a district from which further importations were prohibited after June 29. Sampling was continued until August 7, but no other traces of infestation were discovered.

In all, 179 samples of imported cherries were examined during the season, and of these 11 were found to contain more than 5 per cent. of infested fruit ; in 12, the extent of infestation was not greater than 5 per cent. ; the remaining 156 were free from infestation. No infestation was found in cherries from Belgium, Holland or Switzerland, although samples were taken from 86 consignments originating from these three countries.

Importation of Raw Apples Order of 1930.—This Order was made as the result of the discovery during September and October, 1929, of several consignments of apples imported from the United States of America infested with the larvæ of the Apple Fruit Fly (*Rhagoletis pomonella*), an insect that is a serious pest in North America, but is not known to exist in Europe.

The effect of the Order is to prohibit the landing between July 7 and November 15 in each year of all the lower grades of apples grown in the United States of America; the entry of fruit certified by a duly authorized Inspector of the Federal Department of Agriculture to be of one of the two highest grades recognized by that Department is, however, permitted.

Between July 9 and December 23, 1931, some 600 consignments of North American apples were sampled and examined. No trace of infestation by the larvae of the Apple Fruit Fly was found except in one instance where two apples were observed showing signs of having been damaged by the fly; but individual examination of every apple in two barrels of this consignment failed to reveal the presence of any larvae.

Sale of Diseased Plants Order of 1927.—This Order prohibits the sale for planting of trees and plants that are substantially attacked by certain scheduled fungus diseases and insect pests, or which bear evidence of having been substantially attacked by the Apple Capsid (*Plesiocoris rugicollis*).

During the year 1931 some 1,700 visits have been paid by the Ministry's Inspectors to nurseries, markets and auctions, at which plants have been exposed for sale, and the effect of the Order in maintaining a high standard of health is evidenced by the fact that only one case was seen that called for action under the Order. This solitary instance was one of an apple tree, offered for sale in a West Country market, and observed to be substantially attacked by Canker: the attention of the owner was drawn to the matter and the tree was immediately withdrawn from sale.

Silver Leaf Order of 1923.—This Order requires that all dead wood on premises where plum or apple trees are growing must be removed and burnt before July 15 in each year. As the Ministry had heard statements to the effect that the requirements of the Order were being ignored, it arranged for a special survey of the plum-growing districts in Kent, Cambridgeshire, Isle of Ely, and Worcestershire to be carried out during the months of June, July and August, 1931.

The reports of the Inspectors engaged in this survey showed in every case that not only were the requirements of the Order being generally complied with, but also that the amount of disease present was very small. This confirms the opinion expressed in previous Reports, that fruit growers in general now recognize that the removal and destruction of dead wood are sound measures of orchard hygiene, and that compliance with the Order is to their own advantage. In no case was it necessary to resort to legal proceedings against occupiers for failure to carry out the requirements, although during the twelve months ended December 31, 1931, nearly 2,000 visits were made by the Ministry's Inspectors acting under this Order.

Bulb Diseases (Isles of Scilly) Orders of 1923 and 1924.—These Orders, which were made at the request of the bulb growers of the Scilly Isles with the object of preventing the introduction of Eelworm and other pests and diseases of bulbs, prohibit the entry into the Islands of daffodil and narcissus bulbs unless (1) they have been officially certified

as healthy, or (2) they have been subjected to the warm-water treatment, or (3) they are consigned to the Bulb Treating Station at St. Mary's, there to be submitted to the warm-water treatment before being handed over to the ultimate consignees.

During the year 1931 three licences were issued, under which daffodil and narcissus bulbs from England were consigned to the Bulb Treating Station at St. Mary's.

Onion Smut Order of 1921.—This Order prohibits, *inter alia*, the planting of onions or leeks in infected soil except under licence, and for the past few years it has been the practice of the Ministry to refuse to issue such licences save in exceptional cases where little serious risk of spreading the disease is likely to be involved by the concession. The effectiveness of the Order in preventing the spread of the disease is demonstrated by the fact that only one fresh case has been discovered since 1928. The total number of cases of Onion Smut known to the Ministry to exist in England and Wales is 18, distributed as follows: Northumberland 10, Durham 2, Westmorland 1, Lancashire 1, Northampton 2, Huntingdon 1, Suffolk 1.

Blackcurrant Mite (Norfolk) Order of 1928.—This Order, which is effective within the Administrative County of Norfolk and the County Borough of Great Yarmouth, enables officers appointed by the Local Authority for the purposes of the Order to investigate cases in which growers of blackcurrant bushes complain that bushes growing on other premises within the district are likely to cause "Big Bud" to spread to their own bushes. If the Local Authority are satisfied that the complaint is justified, the owner of the affected bushes may be required to cut down and destroy all affected branches, or to treat the bushes in a prescribed manner. The Ministry is informed that during 1931 no complaints were made to the Local Authority and that any action under the Order was accordingly not necessary.

Fruit Tree Pests (West Norfolk) Order of 1931.—This Order, which was issued on March 28, 1931, and which came into operation on March 30, was made at the request of the Norfolk County Council in consultation with the fruit-growing interests in the county.

It follows the main lines of the Blackcurrant Mite (Norfolk) Order of 1928, and enables officers appointed by the Local Authority for the purposes of the Order to investigate within the scheduled district cases in which growers of fruit trees complain that fruit trees growing on other premises within the district are likely to cause the spread to their

own trees of the following diseases or pests: Fruit Tree Cankers, Brown Rots, Apple and Pear Scab; Fruit Tree Aphides, Apple Sucker, Winter Moth, Codling Moth, Fruit Tree Capsid Bugs, and Fruit Tree Red Spiders. If the Local Authority are satisfied that the complaint is justified, the owner of the affected trees may be required to cut out and burn all affected branches or to treat the trees in a prescribed manner. The Order is operative only within the more important fruit-growing area in the county which lies within the Petty Sessional Divisions of Freebridge Marshland and Clackclose. The Ministry is informed that no action under the Order was taken during 1931.

Fruit Tree Pests (Wisbech District) Order of 1931.—This Order, which was issued and which came into operation on July 6, 1931, was made at the request of the Isle of Ely County Council. It applies only to the important fruit-growing area in that county adjoining that in which the Fruit Tree Pests (West Norfolk) Order of 1931 is operative, and is in similar terms to that Order. The Ministry is informed that no action under this Order was taken during 1931.

Wart Disease of Potatoes Order, 1923.—(a) *Spread of Infection.*—The number of parishes outside the main infected area in which Wart Disease was recorded for the first time in 1931 was 24, a number that compares unfavourably with the figures for 1929 and 1930, but shows a reduction on the number recorded in 1928, a year in which the weather conditions prevailing during the spring and early summer were somewhat similar to those of 1931.

It is worthy of note that whereas in 1930 no cases of the disease were recorded until August 20, in 1931 the first outbreak was reported on July 6; the damp weather that prevailed during the early part of the season produced conditions favourable to the development of the outward signs of the disease, which were accordingly easier to detect, even among early varieties, when the crops were being lifted.

In most cases there appeared to be little doubt that the outbreak was due to previous contamination of the soil and not to the use of infected seed: if there appeared to be any grounds for suspecting the seed, arrangements were made, where practicable, for the examination of crops grown on other land from the same seed. In most instances no further diseased crops were found as the result of these inspections, and it follows that these outbreaks were due to previously contaminated soil.

In two instances, however, the inspections tended to confirm a suspicion that the outbreaks were due to infected seed. An allotment holder in a town in Suffolk in which the disease had not hitherto been known to exist forwarded to the Ministry specimens of some "Epicure" potatoes that were found to be affected with Wart Disease. The Inspector who investigated the outbreak found the disease to exist in potatoes of the same variety growing on two other separate plots in the allotments, although "Arran Chief" and other susceptible main crop varieties growing in the same group were unaffected. The seed in all three cases had been obtained from the same source, and was of Scottish origin. The facts were reported to the Department of Agri-

culture for Scotland, but no trace of Wart Disease could be found on the farm from which the seed originated. The other instance was very similar and "Epicure" seed was again involved. Wart Disease was found on six plots in three distinct groups of allotments and in one private garden in an Essex town. All the growers concerned had purchased their seed from the local Co-operative Society, which had obtained its supplies from Scotland. The Inspectors of the Department of Agriculture for Scotland were, however, unable to find any trace of Wart Disease on the farm where the seed was grown, although crops of the same variety, mostly grown from seed derived from the same source as that supplied to the Co-operative Society, were examined twice.

(b) *Infected Areas*.—As might be expected, the effect of the conditions favouring the development of the disease was felt more severely within the areas known to be infected than in the clean areas, and the number of cases reported from parishes within infected areas was 94 in 1931 as compared with 33 in 1930, and 64 in 1929. There has, however, been no reason to consider any extension of the boundaries of the infected areas, although special attention has been given to potato crops grown in bordering districts.

(c) *Certification of Potatoes*.—The Order requires all potatoes used for planting in England or Wales (except "own saved" seed) to be the subject either of a Clean Land (C.L.) or True Stock (T.S.) certificate; the number of this certificate must be quoted in all seed potato transactions. Where applications for Clean Land certificates emanate from parishes within the infected areas or on the borders of such areas, inspection of the crop is required before the certificate can be issued; in all other cases Clean Land certificates are issued from the Ministry's offices immediately on application. True Stock certificates are issued only in respect of varieties that have been approved by the Minister as being immune from Wart Disease.

Particulars of the certificates issued under the Order during the past three years are as follows:—

	1929	1930	1931
	<i>Crop</i>	<i>Crop</i>	<i>Crop</i>
<i>Clean Land</i>			
Number of certificates issued ..	3,320	3,718	5,291
Acreage	51,653	51,313	64,558
<i>True Stock</i>			
Acreage certified	4,520	2,235	2,309
„ rejected	554	250	420

The number of Clean Land certificates issued and the acreage represented thereby are larger than in any year since the Order came into operation. The increase may be attributed partly to the fact that the requirements of the Order are now more generally realized; but a more important cause is probably the scarcity of seed potatoes of the 1931 crop and the high prices obtainable for them during the planting season. Many growers who in good seasons would have been

able to sell all their crops only for eating purposes or for feeding to stock were able, after obtaining the necessary certificates, to take advantage of the higher prices ruling for seed and to dispose of part of their 1931 crop in this manner.

A further result of the high prices for seed was the receipt of numerous applications for permission to plant imported potatoes, for which in more normal seasons there is little or no demand for seed purposes.

Article 11 of the Order prohibits the planting or sale for planting of any potatoes grown outside Great Britain or Ireland except under licence. No such licences are issued unless the potatoes when imported are accompanied by the certificate prescribed in the Destructive Insects and Pests Order of 1922 to the effect that the potatoes had been examined in the country of origin and found to be healthy and free from diseases and pests, and also that Wart Disease had not occurred within 500 yards of the place where the potatoes had been grown. As an additional precaution every consignment was examined by one of the Ministry's Inspectors by whom the issue of a licence would be recommended only where the potatoes appeared quite healthy and suitable for seed purposes. Licences to sell imported potatoes for planting require the seller to furnish the Ministry with a list of the names and addresses of the purchasers of any of the potatoes, and to inform them in writing that the potatoes were imported and must not be planted or resold for planting until a further licence had been obtained. The total quantity of imported seed of the 1931 crop for which selling licences were issued was just over 1,100 tons received from the following countries: Germany (440 tons), Denmark (360 tons), Holland (150 tons), Latvia (75 tons), Belgium (65 tons), Luxemburg (15 tons), Poland (8 tons), France (1 ton), Norway (1 ton). Quantities of these were, however, eventually disposed of as ware, and the total quantity actually licensed for planting was about 850 tons. Inspectors will take opportunities during the growing and lifting season of examining and reporting on the health of as many as possible of the crops raised from this imported seed.

During the year legal proceedings were taken in respect of the following contraventions of the Order:—

- (1) (a) Removing potatoes from a field infected with Wart Disease, and (b) consigning potatoes grown within an infected area to a place not within an infected area. The defendant, who pleaded not guilty to (a) and guilty to (b), was fined £2 and £3 respectively on the two charges.
- (2) (a) Selling potatoes for planting which were not the subject of a certificate, and (b) making a statement for the purpose of the Order which was false in a material particular. The defendant, against whom previous convictions had been recorded, pleaded guilty; the magistrates imposed penalties of £20 on each charge.
- (3) Similar charges against the same defendant, who again pleaded guilty. The magistrates inflicted the maximum penalty of £50 on each count. This is the first occasion on which the maximum penalty allowed by the Destructive Insects and Pests Act of 1927 has been imposed.
- (4) Similar charges against another defendant, who pleaded guilty and was fined £10 on each charge.

Wart Disease of Potatoes (Amendment) Order of 1929.—This Order was designed as an additional safeguard against the appearance of Wart Disease in the important potato-growing district around Boston and Wisbech. Briefly, the

Order prohibits the planting in allotments not exceeding $\frac{1}{4}$ -acre in extent, and in private gardens within the scheduled area, of any potatoes except certified stocks of approved immune varieties; exceptions from this prohibition are, however, made in respect of potatoes of immune varieties saved from the crop grown on the same land in the previous year, and of five early varieties specified in the Order which are not immune from the disease.

The Inspectors stationed in the district affected by the Order found that, notwithstanding the publicity given to the provisions of the Order by the local authorities concerned, many people were unaware of the restrictions. No legal proceedings were taken in respect of contraventions, but warning letters were addressed to representative gardeners and allotment holders in various parts of the scheduled area who had infringed the Order. The replies to these letters indicated that the contraventions were due, not to wilful defiance of the regulations, but to ignorance of the restrictions, and the effect of these warnings coupled with the renewed publicity afforded by the local authorities in the early part of the season should become evident in future years.

Potato Testing Station.—Particulars have been given in previous reports of the arrangements made by the Ministry for carrying out each year at the Potato Testing Station of the National Institute of Agricultural Botany at Ormskirk, Lancashire, trials of new varieties of potatoes with the object of determining their immunity from or susceptibility to Wart Disease, and for the co-ordination of the results of these trials with those carried out at Philpstoun and Kilkeel by the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland respectively.

In 1931 the number of stocks included in the second and subsequent years' tests was 41, of which 4 developed Wart Disease. Of the 45 entries for the first year's tests 7 became infected, 3 proved to be synonyms of existing varieties, 7 were too poor to judge and 35 were distinct varieties.

Twenty-six new varieties were recommended for approval as the result of the 1931 trials, but only 4 of these have actually been added to the approved list. In the remaining cases inclusion has been postponed until such time as the raisers have intimated that the varieties have actually been, or will shortly be, introduced into commerce.

(Concluded.)

* * * * *

MARKETING NOTES

National Mark Beef.—The weekly average numbers of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during July, August and September, 1931 and 1932, and the three weeks ended October 22, 1932, were as follows :—

LONDON AREA— WEEKLY AVERAGES

<i>Period</i>	<i>London</i>	<i>Birkenhead</i>	<i>Scotland*</i>	<i>Total London supplies</i>
July, 1931	1,519	88	987	2,594
July, 1932	1,013	207	850	2,070
August, 1931	1,496	127	1,070	2,693
August, 1932	1,283	187	941	2,411
September, 1931 ..	1,687	174	1,061	2,922
September, 1932 ..	1,523	489	1,073	3,085
Three weeks ended October 22, 1932	1,492	979	1,012	3,483

* Figures include Scotch sides graded and marked in London.

BIRMINGHAM AND YORKSHIRE AREAS—WEEKLY AVERAGES

<i>Period</i>	<i>Birmingham</i>	<i>Leeds</i>	<i>Bradford</i>	<i>Halifax</i>
July, 1931	481	466	340	51
July, 1932	756	299	261	61
August, 1931	493	369	396	81
August, 1932	812	360	321	68
September, 1931 ..	670	490	397	99
September, 1932 ..	977	403	309	86
Three weeks ended October 22, 1932	1,057	495	414	102

The total number of home-killed and Scotch-killed sides graded and marked for the London area during September (13,229) compares favourably with the numbers for the two preceding months and shows an increase of 704 sides over the figure of 12,525 for September, 1931. The scheme is making satisfactory progress in the Birmingham area where 4,188 sides were graded and marked during September. There has also been an increase in the number of sides marked in the Yorkshire area. The position as regards the Scheme generally can, therefore, be considered as encouraging.

The experiment that was begun early in 1930 in consigning fat cattle direct from farm to abattoir, for sale by dead weight on the basis of the National Mark beef grades *Select*, *Prime* and *Good*, has made considerable progress during the past few months. In the three months ended September 30, 1932, 56 consignments (436 cattle) were received for sale by this method as compared with 15 consignments (106 cattle) during the corresponding period of last year.

National Mark Fruit.—It is reported that heavier supplies of National Mark fresh fruit (particularly of apples and tomatoes) were reaching Covent Garden Market, London, towards the end of September of this year than at any time since the inception of the schemes. Uniformly good prices have been realized and the demand continues to exceed the supply.

Considerable interest has been shown in the scheme for plums, which has just completed its first season, during which 89 growers were authorized to pack under the National Mark. Despite lower supplies, owing to unfavourable weather conditions, fair quantities of well-graded National Mark plums were received at most of the principal fruit markets, and are reported to have realized prices in excess of those realized by ungraded fruit. The results obtained have demonstrated that there is a widespread demand for home-grown plums of guaranteed quality and weight in standard containers.

National Mark Honey.—The list of authorized packers under the Scheme has been extended by the enrolment of three commercial beekeepers and of the following associations :—

Bucks Beekeepers' Association, Chartridge, Chesham.

Cheshire Beekeepers' Association, St. Mary's Road, Bowdon.

Sussex Beekeepers' Association, Combe Lodge, Bury, Pullborough.

Warwickshire Beekeepers' Association (Coventry Branch), 68 St. Michael's Road, Coventry.

Proposed National Mark Scheme for Vegetables.—As a preliminary to the introduction in 1933 of a National Mark Scheme for cauliflowers and broccoli, the Ministry has been in consultation with leading growers and distributors, and has now formulated proposals for standard grades and packages. The grades agreed upon for both these vegetables are *Selected Large* and *Selected*.

Growers and others who are interested in the production and marketing of these vegetables may obtain, free of charge, copies of the Ministry's demonstration leaflet "S," which describes the proposed scheme, upon application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

The Grading of Eggs.—When the National Mark Egg Scheme was introduced in 1929, the requirement that the minimum weight of each egg must be guaranteed emphasized the need for mechanical grading apparatus.

Difficulties had to be overcome in handling, with speed and accuracy, so fragile a product, but it was not long before there were invented improved machines that, besides grading with accuracy, worked at more than double the speed of the original models. No fewer than seven different models have been produced, and of these five were invented and are being manufactured in this country.

There are now 132 mechanical graders—most of which are power driven—in use in the 145 stations authorized to pack eggs under the National Mark.

Marketing Demonstrations.—At the London Dairy Show held at the Agricultural Hall, October 18–21, a suggested scheme for the application of the National Mark to home-produced farm and creamery butter was demonstrated on the Ministry's stand, which also included displays of all National Mark commodities in season.

The Ministry's stand at the Imperial Fruit Show, Birmingham, October 21–29, was mainly taken up with a demonstration of the National Mark Schemes for fruits. A section of the stand was, however, devoted to the marketing of vegetables. Besides the demonstration of the proposed National Mark Scheme for cabbage lettuce referred to in the September issue of this JOURNAL, details of a suggested scheme for home-grown cauliflower and broccoli, as mentioned on page 757 of these notes, were shown for the first time. These included graded packs in the suggested standard rigid and collapsible wooden crates, as well as separate heads illustrating the grading.

The cauliflower and broccoli demonstration was also staged at the Holland Potato Show held at Boston on October 27, and will be repeated at the Gloucester Root, Fruit and Grain Society's Show on November 9, and at other Shows in different parts of the country before the scheme is actually introduced.

Demonstrations of the marketing of mutton and lamb will be staged at the Birmingham Cattle Show, November 26 to December 1, and at the Smithfield Club Show, London, December 5–9.

Displays of National Mark and other Home Produce.—A wide range of home-produced fruit and fruit products, most of which was packed under the National Mark, was displayed on the England and Wales Stand in the Empire Marketing Board's Section at the Imperial Fruit Show. National Mark products were also displayed at the South Wales Grocery and Allied Trades' Exhibition held at Swansea, October 11–20.

Excellent results attended the Ministry's occupation, for the fortnight ended October 8, of the Empire Shop at Cardiff. Both the public and the trade showed a keen interest in the English and Welsh produce displayed. No less than 32,605 tasting samples were sold during the fortnight. The interest displayed by retailers was especially gratifying and much useful information was disseminated, particularly with regard to National Mark commodities. The venture has undoubtedly given a valuable stimulus in the district to the sale of home-produced foodstuffs.

Publicity for National Mark Products.—One National Mark Shopping "Week" was held in October, namely, at Swansea, October 11–20, in association with the Ministry's display of National Mark products at the South Wales Grocery and Allied Trades' Exhibition. Suitable advertisements were placed in local newspapers, and the traders made special displays of National Mark commodities, particularly of canned fruit and vegetables.

The National Mark, representing as it does national standards of quality, weight grades and packs for the various products to which it has been applied, provides an ideal basis for advertising in its widest sense. Following the Ministry's pioneer efforts in giving publicity to National Mark products, many firms and individuals engaged in their sale have advertised on their own account. Two recent examples of such advertising may be quoted. No fewer than 250 retail butchers in Leeds, Bradford and Halifax who sell National Mark beef have installed small illuminated cabinets in their shop windows in which one of the Ministry's transparent posters showing the grade marks on a side of beef and a card bearing the slogan "Look for the Mark—Don't shop in the Dark" are displayed during and after business hours. With the co-operation of a retail grocer, a Beekeepers' Association staged for a fortnight in September a full window display of National Mark honey complete with an observation hive. It is reported that the display created considerable interest, that sales of English honey were very heavy, more being sold in a week than in a normal year, and that illustrated paragraphs referring to the display appeared in the local Press.

At the end of September, the Ministry approached gas and electricity supply authorities in the following towns with the object of inducing them to hold National Mark flour cookery demonstrations for housewives in the autumn and winter

months: Leicester, Northampton, Luton, Colchester, Cambridge, Nottingham, Kettering, Yarmouth, Norwich, Coventry, Bedford, Lowestoft and Ipswich. The response has been encouraging and many of the authorities concerned have signified their willingness to co-operate with the Ministry in arranging demonstrations.

The Ministry has issued a new leaflet (Marketing Leaflet No. 12 G) on the subject of National Mark flour, containing recipes for the baking of cakes, scones, pastry and bread. Copies of this leaflet may be obtained free of charge on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

Agricultural Marketing Act, 1931 : Hops Marketing Board.—

A loan of £550 has been made to the Hops Marketing Board out of the Agricultural Marketing Fund, to cover expenses incurred in connexion with the initial poll of producers that was held on the question whether the Hops Marketing Scheme should remain in force.

This year's crop is estimated by the Board at 183,000 cwt., and is reported to be of vintage quality.

The Board notified its agents that trading would commence on October 10. Before that date there had been some trade to satisfy brewers' early requirements under a deposit of £10 per pocket.

Wheat Act, 1932.—A leaflet (Marketing Leaflet No. 33) has been prepared, containing a short explanation of the Act, for the information of growers and others who may be interested in the working of the scheme to secure a standard price and a certain market for home-grown millable wheat. Copies of the leaflet may be obtained free of charge on application to the Ministry.

Canada : Grading helps Poultry Exports.*—The Government grading of dressed poultry (referred to in the Marketing Notes in the September issue of this JOURNAL), combined with the general development of poultry raising in Canada, has resulted in a large increase of exports, particularly to Great Britain. Four years ago, no poultry was sent to Great Britain from Canada, but in May of this year 17,771 lb. were exported as compared with 35,661 lb. during the whole of 1931. Exports to Bermuda and Newfoundland are also steadily increasing.

* *Co-operation and Markets News*, Department of Agriculture, Regina, Sask.

The Netherlands "Crisis Pig Act."—This Act, which came into force on August 15 last, aims at the stabilization of the Dutch pig industry for three years and the elimination of the production-cycle.

The Act provides for the centralized control of the production, sale, export and import of pigs, and of the manufacture and export of bacon; the equalization of prices for pigs for home consumption and for manufacture into export bacon; the progressive raising of producers' prices to a reasonable level; and the imposition of a levy on imports sufficient to prevent the undercutting of home prices.

The machinery for operating the scheme is as follows:—

(a) A Pig Central consisting of representatives of pig breeders and keepers, exporters of pig-meat and other interested persons. These are appointed by the Minister, after consultation with representative organizations. In addition, there are neutral members.

(b) Provincial Boards elected by pig producers in each of the 11 provinces.

(c) District organizations of pig producers, with Boards elected by them. There are from 20 to 100 of these in each province. The average district includes about 350 farms and 3,500 pigs.

A Government Commissioner has been appointed to advise the Minister in connexion with the operation of the statute.

The method of operating the scheme is as follows:—

(a) *Control of Production.*—All pigs over 10 kilograms (22 lb.) must be earmarked with a special mark. These marks are only obtainable through the District Boards. In this way, it is ensured that all pig breeders are members of the District Organizations.

The Minister, on the advice of the Pig Central, fixes the total number of marks to be issued, and also, in consultation with the Provincial and District Boards, the quantities to be allotted to each Board. The District Boards distribute the marks to their members. The Pig Central thus has complete control over the number of pigs permitted to reach maturity. Producers who find that, owing to litters being larger than they expected, or to any other reason, they require more marks than are due to them, can only obtain additional marks on payment of a very high fee. Whereas the normal fee for a mark is merely nominal, viz., 25 cents (6½d.), to cover administrative costs the charge for extra marks is at present 5 to 10 florins (11s. 0d. to 22s. 0d.), and can if necessary be made higher, so that in the majority of cases farmers do not find it worth while to rear the extra pigs beyond the weaner stage.

In order to supplement the quantitative control, the District and Provincial Boards may control breeding policy and such matters as (i) the weight at which pigs may be sold, and (ii) by and to whom they may be sold, in the areas they represent. Appeal against any action of the District Boards may be made to the Provincial Boards, and against any action of the Provincial Board to the Pig Central.

Although pig feeders who are not breeders need not be members of the District Organizations, they are sufficiently controlled by the wide powers of the latter, together with the requirement that all store pigs must be marked. The suggestion has been made that large farmers may tend to buy up an undue proportion of the marked pigs.

If this takes place, it would be revealed by a rise of prices. A close watch is being maintained and, if necessary, appropriate measures will be taken to deal with such a situation if it arises.

(b) *Control of Sales.*—All sales of pigs for manufacture or export must be made through the Central. The pigs are delivered to the Central's collecting depots, and are paid for at the standard rate as described below. Sales to butchers continue as hitherto; the prices paid by butchers are not controlled directly, but naturally tend to approximate closely to the level fixed for purchases by the Central, which is published from time to time.

(c) *Price Maintenance and Equalization.*—The object of the Central is to stabilize producers' prices for pigs at a level that covers costs of production plus a reasonable profit. The formula used is 20 cents plus four times the feed price per kilogram of feed for every kilogram live weight—i.e., 2.4*d.* plus four times the feed price per lb., for every lb. live weight. The 20 cents is supposed to cover the cost of the litter plus a fair return for the risk and labour of production. The Central proposes to approach gradually this ultimate stabilized price.

The maintenance of prices is effected through the Central's control of the number of pigs produced and of the quantities of pigs and pig products disposed of abroad and in the home market. The payment of an enhanced price involves losses on the sales for export which have to be covered by higher prices to the home consumer. At a given time, the Central estimates what it is possible or expedient to make the home consumer pay for pig-meat, and adjusts supplies reaching the home market to a quantity that will secure this price. On the basis of this price, the Central fixes its current standard price and a levy payable by butchers per kilogram dead weight on pigs killed for home consumption. This is collected by meat inspectors appointed under existing legislation. The levy is paid into a stabilization fund, as are also the levies on imports and any profits that may later accrue—e.g., from export sales. The butchers' levy and the standard price must of course be so fixed that butchers can afford to pay approximately the standard price for pigs under the ruling prices for pig-meat. The levy at the beginning of September was 9 cents per kilogram (1.1*d.* per lb.) dead weight; and the standard price payable to producers was 30 cents per kilogram (3½*d.* per lb.) live weight.

The Central is carefully watching the home market to see how it reacts to the price-raising policy, the object of which is to secure a maximum net return on sales of pig-meat in the home market. Subject always to losses in the export market, which would necessarily increase the rate of levy, the upper limit of this price policy will be reached when the Central's cost of production formula is realized.

(d) *Control of Manufacture.*—The manufacture of bacon is completely under the control of the Pig Central. Factories receive their supplies from the collecting stations of the Central, and are bound to manufacture as and when directed; if necessary, the method of cure will also be controlled. The Central co-operates with the Government inspection service, which already exists at the factories. Factories are guaranteed by the Central a return which includes:—

- (i) an allowance to cover fixed costs. All factories are being valued on the same basis, and the average costs of management, etc., over the past few years are being taken;
- (ii) an amount per kilogram of bacon manufactured. This is the same at all factories;
- (iii) a small amount to cover risk-bearing and profit.

A factory may be permitted on application to cease manufacture temporarily, in which case it will receive only an allowance for fixed costs.

(e) *Control of Exports.*—The existing export organization has passed under the control of the Pig Central. Factories are required to deliver for export as ordered. Exports of pigs and pig-meat are controlled, so as to maintain the home market at the optimum level.

(f) *Control of Imports of Pigs and Pig-meat.*—The Pig Central also has monopoly rights over imports, but at present, at least, it does not directly restrict their quantity. It simply imposes levies on imports corresponding to the difference ("margin") between the world price and the home market price. The basis taken for the index of the world price is the Danish factory price for bacon pigs.

* * * * *

LICENSING OF STALLIONS UNDER THE HORSE BREEDING ACT, 1918

THE number of stallions licensed under the Horse Breeding Act, 1918, in England and Wales, in each year since 1926, has been as follows :—

<i>Service Season</i>	1926	1927	1928	1929	1930	1931	1932
Shires .. .	829	772	720	760	752	761	853
Other heavy horses	324	328	313	329	335	342	358
Light horses (including ponies)..	455	437	381	347	343	329	266
	<u>1,608</u>	<u>1,537</u>	<u>1,414</u>	<u>1,436</u>	<u>1,430</u>	<u>1,432</u>	<u>1,477</u>

It will be seen that the total number licensed in 1932 was larger than in any year since 1927, and showed an increase of 45 as compared with 1931. The increase in 1932 was wholly in heavy stallions, which numbered 1,211 against 1,103 in the previous year. Applications for licences in respect of light stallions have declined each year since 1921, and the number of light stallions licensed in 1932 showed a reduction of 63, or nearly 20 per cent., as compared with 1931.

The increase in heavy stallions was mainly in Shires, which numbered 853, or 92 more than in 1931, but Percherons showed a relatively larger increase, viz., from 48 to 57. The number of Suffolks and Clydesdales was practically unchanged at 136 and 130 respectively. None of the light breeds (including ponies) showed any increase, and decreases were relatively sharp in some cases. Thoroughbreds declined by 22 to 166, while ponies numbered only 51 against 85 in the previous year.

Licences were refused in respect of 45 stallions, an increase of 7 as compared with 1931, but the number of appeals against refusals declined by 4. Only 7 appeals were lodged, and 3 of these were successful. The breeds of the stallions rejected and the reasons for their rejection are given in the next table.

NUMBER OF APPLICATIONS FOR LICENCES NOT GRANTED AND GROUNDS OF REFUSAL, 1932.

BREED	Number Refused	Percentage Refused	DISEASE								
			Cataract	Roaring	Whistling	Ringbone	Sidebone	Bone Spavin	Shivering	Stringhalt	Defective Genital Organs
PEDIGREE—											
Shire ..	28	3.5	1	7	12*	1	4	—	3	—	—
Suffolk ..	3	2.2	—	—	1	—	1	—	—	—	1
Clydesdale ..	3	2.6	—	1	1†	—	1	—	—	—	—
Percheron .	2	3.6	—	—	1	—	1	—	—	—	—
Thoroughbred ..	3	1.8	—	—	1	—	—	1	—	1	—
Welsh Cob .	1	6.7	—	—	—	—	—	1	—	—	—
NON-PEDIGREE—											
Heavy ..	5	3.8	1	—	1	1	1†	—	1	—	—
TOTALS ..	45	3.0	2	8	17	2	8	2	4	1	1

* One also affected with Sidebone. † Also affected with Sidebone.
‡ Also affected with Ringbone.

Nineteen infringements of the Act were reported to the Ministry during the season, a decrease of 5 on the preceding year. Most of these infringements were in respect of the travelling or exhibiting for service of licensed stallions unaccompanied by the licences, and the owners and leaders were warned as to the requirements of the Act in this respect. Successful proceedings were taken by the police in two instances where unlicensed stallions were being travelled for service.

Stallion owners in possession of licences for the year ended October 31, 1932, are reminded that these licences expired on that date, and should have been returned to the Ministry. Applications for licences for the 1933 travelling season may be made as from November 1, and it will greatly assist the Ministry to make economical arrangements for the examination of stallions if applications are made as early as possible after that date. Application forms may be obtained from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

NUMBER OF APPLICATIONS FOR LICENCES AND NUMBER OF LICENCES GRANTED AND REFUSED RESPECTIVELY IN ENGLAND AND WALES, 1932.

BREED OR TYPE	PEDIGREE (i.e., Stallions entered or accepted for entry in the recognized Stud Book of their Breed)			NON-PEDIGREE (i.e., Stallions not entered or accepted for entry in a recognized Stud Book)			TOTALS OF EACH BREED AND TYPE (Pedigree and non-Pedigree)		
	Applications	Licensed	Refused	Applications	Licensed	Refused	Applications	Licensed	Refused
HEAVY—									
Shire ..	809	781	28	74	72	2	883	853	30
Clydesdale ..	117	114	3	16	16	—	133	130	3
Suffolk ..	137	134	3	3	2	1	140	136	4
Percheron ..	56	54	2	3	3	—	59	57	2
Others ..	—	—	—	37	35	2	37	35	2
LIGHT—									
Hackney ..	20	20	—	4	4	—	24	24	—
Thoroughbred ..	166	163	3	3	3	—	169	166	3
Arab ..	5	5	—	3	3	—	8	8	—
Cleveland Bay ..	3	3	—	—	—	—	3	3	—
Welsh Roadster ..	1	1	—	—	—	—	1	1	—
Hunter ..	2	2	—	1	1	—	3	3	—
Yorkshire Coach ..	1	1	—	—	—	—	1	1	—
Others ..	—	—	—	9	9	—	9	9	—
PONY AND COB—									
Welsh ..	7	7	—	—	—	—	7	7	—
Fell ..	1	1	—	—	—	—	1	1	—
Dales ..	8	8	—	3	3	—	11	11	—
Polo and Riding ..	8	8	—	—	—	—	8	8	—
Shetland ..	4	4	—	—	—	—	4	4	—
New Forest ..	1	1	—	—	—	—	1	1	—
Welsh Cob ..	15	14	1	5	5	—	20	19	1
Others ..	—	—	—	—	—	—	—	—	—
TOTALS ..	1,361	1,321	40	161	156	5	1,522	1,477	45

NOVEMBER ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,
Director of Agriculture for West Sussex.

Autumn Sowing.—On heavy soils the best time for sowing cereals has passed, and unless conditions are very favourable any of the heavy soils that have not been seeded should be left for spring sowing. On medium and light soils seeding of wheat may continue throughout the month and even in December. In the southern counties, where land is in good manurial condition sowing as late as December is quite successful. An increase in the seed rate is always required as the date of sowing advances, as with a colder soil germination is slower and the death rate of seedlings is increased. More plants per acre are necessary with late-sown crops, which are less able to provide productive tillers; tillering does take place, but it is doubtful whether these are a real advantage as many of them fail to come to maturity and the individual heads of a late-sown crop are often disappointing. By sowing thickly the tendency to tiller is checked and stronger individual stems may result.

Damage by Birds.—Another difficulty with late-sown crops is the damage done by rooks, starlings and even larks. Starlings and larks are usually most troublesome when the young plants are just coming above ground, and if a field is selected by a flock of either of these birds the damage is usually severe. Rooks, however, are in evidence immediately the seed is sown, and the crop is subject to attack until it is above ground. Many methods are adopted to cope with the attack of rooks. Some farmers may comfort themselves with the thought that the rooks are after wireworms and that if they do take some grain it is more than likely that the reduction of wireworms will be some compensation. It is quite true that where wireworms are attacking a crop, rooks will persist in coming to the field even after the plants are well through the ground. When, however, rooks visit a field on the day it is sown or for ten days afterwards, grain is most probably the attraction. Grain is often treated to make it distasteful to birds, but many of the dressings interfere with the regular flow of the seed through a corn drill and uneven distribution may result.

“Scarecrows” are a common feature in the corn fields at this season of the year; the trouble is that they are so common that the birds get used to them and they become ineffective. Another method commonly practised is to shoot a number of

rooks and tie the dead birds to string stretched between stakes, or to leave them on the field with their wings stretched out. It has been said that a dead cat is an effective scarecrow, and the writer knows of one instance where a stuffed fox was used for the purpose. Any of these methods may be effective for a limited time, but rooks are particularly "knowing" birds and unless there are frequent changes in the methods pursued any scarecrow becomes familiar and contempt follows.

Preparing for "Roots."—Much can be done at this time to ensure the success of next year's root crop, whether potatoes, mangolds, sugar beet or any one of the numerous cruciferous crops.

On light land frequent autumn cultivations may be preferable to early ploughing, unless farmyard manure is being applied now. In all cases where farmyard manure is put on arable land there should be as little delay as possible before ploughing in order to avoid waste.

Farmyard manure need not be buried deeply, and it is good practise to plough comparatively shallowly when burying the manure and leave the deep ploughing, so beneficial to roots generally and especially sugar beet, to the second ploughing. On light soils the deep ploughing may be postponed to February, or even March, but with heavy soils all deep ploughing should be finished before Christmas so that it will have the advantage of any midwinter frosts. If farmyard manure is not being applied in autumn there is no hurry about ploughing light land provided it has been cultivated and all weed growth destroyed; on heavy land the deep ploughing may be done at once.

Drainage of Land.—Land that is insufficiently drained cannot be productive. Water-logging restricts the area in which the roots of our most valuable crops can live and thrive. On water-logged land manures cannot exert their full influence.

Even under grass, badly drained land gives poor returns in produce, and live stock suffer not only from the poor character of the herbage but are also more subject to diseases.

It is not too much to say that efficient drainage is the first essential to successful agriculture. In this country large areas of land were artificially drained fifty to eighty years ago, when grain prices were high and labour was cheap. In recent years the cost had been so high that very little pipe draining has been done, and a generation of farmers is growing up who know nothing of the practice.

New drainage is not necessary where a proper system was laid down many years ago, but much land is now suffering from water-logging owing to neglect of the necessary attention to maintenance.

Ditches may be efficient drainage channels in themselves and drain an appreciable amount of the land through which they pass, but they are also the exits for most of the land drains, and unless the ditches are kept in order the land drains become blocked and the whole drainage system fails.

Cleaning of ditches should be a regular feature of the farm work each year. This suggestion is extremely elementary, but one cannot help noting the amount of neglect in this connexion and the evil consequences that follow.

On some of the heavier types of soils the original pipe drains were put in too deep to be efficient, and here mole draining can be used to advantage. It is a mistake to mole-drain at a shallow depth of under fifteen inches ; such drains do not last and soon become quite ineffective. The efficiency of mole draining depends on the nature of the subsoil ; a clay subsoil provides the best type of channel and there are instances where mole draining has continued to give satisfaction for fifteen to twenty years. The farm type of tractor can be used to haul a mole plough, but a general fault has been too shallow mole ploughing, as it was found that the lighter types had difficulty in hauling the plough at anything like eighteen inches deep. Now that winch attachments are available there is no reason why efficient mole draining should not be done by a tractor so equipped.

Rats and Mice.—If a census could be taken of these pests it would be found that the numbers vary considerably from time to time and from place to place. Various estimates have been made as to the damage done each year, and though these may not be reliable, it cannot be doubted that the damage and dangers are very considerable. The farmer is not the only person who suffers loss from rats and mice, and his efforts at reduction will be nullified if owners and occupiers of other property neglect to pursue a like policy. Migration of rats is well known to take place.

The fight against rats must be continuous, and there should be no slacking off when the numbers appear to be reduced to a few that are doing only a small amount of damage.

When rats are few they are usually healthier and their great prolificacy will soon re-populate a set of buildings. Destruction

of rats is only one part of the campaign ; much can be done by rat-proofing buildings and keeping food out of reach of the vermin.

On the farm this is difficult. Stacks of grain are favourite places and continuous care is needed to prevent rats and mice from entering them. A few cats kept in or about the farm buildings will often be fairly effective in keeping down rats and mice provided there is not a big infestation.

Where poultry or pigs are kept rats are very difficult to deal with as they harbour in hedgerows and banks, or in the ground. All poultry houses should be constructed in such a way that rats cannot enter them or burrow underneath. To prevent burrowing, wire netting of one inch mesh should be fixed to the houses and buried from 12 to 15 inches deep ; in dry soils even greater depth is necessary to prevent the rats burrowing underneath the wire. The wire should be spread outwards along the bottom of a trench and be kept well down to the undisturbed soil.

When rats infest places from which they are difficult to dislodge it is a good plan to prepare a site for them by putting down some dry litter and laying corrugated iron sheets over it. If this is placed in an open situation somewhere near where they feed they will soon use it for sleeping and nesting, and with the help of a good dog may be easily destroyed.

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NOTES ON MANURES

H. V. GARNER, M.A., B.Sc.,

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Phosphate for Wheat.—With better prices in prospect for next year's crop, farmers will endeavour to secure as good a yield of wheat as possible. Nitrogen will be the main factor in securing this, but its use will be deferred till spring. As far as autumn applications are concerned, some phosphatic dressing will be in place on land that is known to respond to it ; the result will be to improve the straw, fill the grain and somewhat hasten maturity. The function of the minerals is to balance the effect of the nitrogen given later, and, although both phosphate and potash are necessary for this purpose, phosphate more often than potash is deficient on typical wheat land. A useful dressing would be about 2-3 cwt. per acre of superphosphate or high-soluble basic slag. If the autumn dressing is not given before drilling, the superphosphate may yet be applied in spring mixed with the nitrogenous top-dressing,

and the manures should be harrowed in as well as the condition of the plant will allow. Only on light or chalky soil is potash likely to be needed for wheat, and then 1 cwt. of muriate of potash can be used in winter or as an early spring top-dressing. Should wheat follow a ley or root crop that has been well treated with phosphate, further phosphatic manure should not be necessary; and, if it is feared that the land is over-rich, nitrogen also should be omitted in the spring. This applies more particularly in wet districts after ploughing-in an old ley full of clover.

Poultry Manure.—The head of poultry kept in this country continues to increase. Fowls, which constitute by far the most important section, numbered in England and Wales 24·8 million in 1921, 36·6 million in 1926, and 52·6 million in 1931. When we consider that the fowl, like the pig, is fed largely on concentrated foods, some idea of the importance of poultry manure may be obtained. There is little doubt that much of this manure is not used to the best advantage.

Where the head of stock is small in relation to the land under cultivation, chicken manure is as a rule highly-valued on the holding for market garden and general root crops, and no difficulty is experienced in using it up. When well stored under cover, it is highly nitrogenous, containing 3 per cent. or more of nitrogen, and forms a rather forcing manure. Even when exposed and diluted with moisture, grit, or litter it is usually, ton for ton, considerably richer than farmyard manure, and the nitrogen itself will probably be rather more active. These points should be borne in mind when deciding how much to apply per acre. Two tons per acre would be a generous dressing of the better material, and even a poor sample need not be applied at more than double that rate.

When a large head of stock is kept and the supply of manure is more than can be usefully employed on the land available, some outlet for the surplus is required. Neighbouring farmers may take the manure at an agreed price, but, in making a bargain of this kind, some estimate should be made of the real value of the manure under the system of management in question. If it can be arranged to have a determination of total nitrogen made on a few typical samples, so much the better. At the present time, 1 unit of quick-acting nitrogen (i.e., 1 per cent. of 1 ton) in sulphate of ammonia is worth about 5s. This is a much lower figure than prevailed several years ago, and the nitrogen values in nitrogenous manures in general must be reconsidered in view of the present cheapness of mineral

nitrogen. Moreover, it is not correct to assume that the whole of the nitrogen in poultry manure is of the same immediate value as that of sulphate of ammonia. On the other hand, we have the fact that poultry manure contains appreciable amounts of phosphoric acid and a little potash, and a considerable quantity of organic matter. As an organic manure, large dressings may be given with a view to building up condition in the soil without such injury as might result from an overdose of inorganic salts; and this property is especially useful to market growers of fruit and vegetables. We must also remember that nitrogen in the form of commercial organic manures still costs considerably more per unit than it does in sulphate of ammonia. The present prices are, for example, about 15s. per unit in hoof and horn, and 13s. per unit in meat meal. Hence we can hardly value the organic nitrogen in poultry manure severely on the sulphate of ammonia basis, for those who desire to obtain organic nitrogen have to pay dearer for it. As a working guide, and until precise data have been accumulated, some middle course between the plain mineral value of the nitrogen and the rather fancy prices commanded by the nitrogen of certain organic manures seems reasonable; and nearer the lower is preferable to the higher limit. This price would also take into account the value of the other fertilizing constituents and of the organic matter. Farmers, who usually think in terms of mineral fertilizers, will probably tend to pay nearer the mineral price for their nitrogen than market gardeners by whom organic manures are more highly esteemed.

Experiments concerning the relative value of the nitrogen of sulphate of ammonia and of poultry manure are only just beginning. Horticultural crops are chosen, since it is commonly believed that organic manures have special value for these crops. At present, the results of only one experiment, that conducted at the Swanley Horticultural College, are available; and this is cited because it shows that, within the limits of the experiment, poultry manure is equal to commercial guano, and both are if anything slightly superior to the inorganic source of nitrogen. The crop was brussels sprouts.

BRUSSELS SPROUTS: CWT. PER ACRE. SWANLEY, 1931

	No nitrogen	1 cwt. sulphate of amm.	2 cwt. sulphate of amm.	Guano	Poultry manure
Sprouts (three pickings)	48.1	45.7	47.2	51.8	53.9
Blown sprouts	14.1	17.1	18.6	19.7	20.6
Total crop	62.2	62.8	65.8	71.5	74.5

All plots received a basal dressing of phosphate and potash and the organic manures supplied the same amount of total nitrogen as 2 cwt. of sulphate of ammonia. This experiment is being repeated, and too much reliance should not be placed on the result of the above single trial.

With a very large production of poultry manure in one area, it has been found practicable to dispose of it by a system under which the material is collected, dried and bagged. Samples of manure, containing 12.6 per cent. of moisture and 3.63 per cent. of nitrogen, have been produced by sun-drying on the farm. Using special drying and grinding plant, a very dry, powdery product containing about 10 per cent. of moisture, 4.1-3.3 per cent. of nitrogen, about 3.5 per cent. of phosphoric acid and 1-2 per cent. of potash, can be obtained on the factory scale, and is under trial in this country.

There is little doubt that the manufacture of a dried guano is the most hopeful outlet for large accumulations of poultry manure. It has already been done in the Philadelphia feeding stations and the progress of similar schemes in England will be watched with interest.*

Dung in Rotation.—Most of the classical, long-period experiments carried out with farmyard manure have compared yearly dressings of dung with corresponding dressings of artificial fertilizers. Such experiments have been carried out, for example, at Rothamsted, Woburn, Saxmundham and elsewhere. and, in general, the results show that, year by year, the dung and artificials each give good and approximately-equal crops, while the dung also builds up a considerable reserve of fertility when used in this way.

There is, however, less evidence of the action of dung when used in the usual manner, i.e., applied at the beginning of a rotation of crops. Most farmers regard farmyard manure as the basis of fertility, but few could say to what extent dung was responsible for raising the level of their farming. A few instances in which this has been ascertained are given below.

A good example is the well-known rotation experiment carried out on Backhouse field, Cockle Park, Northumberland, since 1897. The soil is light and, as the experiment showed, deficient in potash. A large number of alternative methods of distributing dung and artificials over the crops of a four-

* An interesting account of the production of kiln-dried and ground manure on a large poultry farm at Bury St. Edmunds is given by R. Sayce and F. Hanley in this JOURNAL, October, 1932, p. 656. The dried product contained on the average 4.31 per cent. N, 2.92 per cent. P_2O_5 , 1.28 per cent. K_2O , and 3.55 per cent. CaO .

course rotation have been tested and, of these, the following bear on the points in question. The figures are averages of yields published in the Cockle Park Reports.

COCKLE PARK: YIELDS PER ACRE. AVERAGE OF SIX ROTATIONS, 1897-1920

Plot No.	Nature of manuring	Barley*			Oats		
		Turnips tons	Grain cwt.	Straw cwt.	Hay cwt.	Grain cwt.	Straw cwt.
1	No manure	7.5	8.8	14.3	20.0	10.4	16.4
4	7 cwt. artificials† to turnips	17.0	15.0	20.2	22.4	17.3	22.4
13	14 cwt. artificials to turnips						
	7 cwt. artificials to hay‡	18.5	21.2	26.1	33.4	19.2	27.7
	Nitrogenous manure to corn						
15	10 tons of dung to turnips	19.2	20.7	27.5	28.0	20.2	26.1
17	10 tons of dung to turnips	20.0	22.3	29.0	42.1	20.5	26.0
	7 cwt. artificials to hay						

* Oats in 1898.

† 25 lb. N., 75 lb. P_2O_5 , 50 lb. K_2O per acre.

‡ 17.5 lb. N., 100 lb. P_2O_5 , 50 lb. K_2O per acre.

The striking effect of dung in raising the level of the rotation is seen by comparing Plots Nos. 1 and 15, the yields of most of the crops being almost doubled. Artificials in moderate quantity (Plot 17) have a good effect all through the rotation, but even the heavy dressings on Plot 15 are not markedly superior to the dung. The further addition of artificials to dung on Plot 17 markedly improves the hay, but has little effect on the other crops.

The heavy clay soil at Saxmundham, Suffolk, is markedly deficient in phosphate. A rotation experiment has been in progress at this Station since 1900, and the average of 10 years, during the period 1907-17, gives the following results:—

Plot No.	Nature of manuring	Mangolds tons	Barley		Beans		Wheat	
			Grain bus.	Straw cwt.	Grain bus.	Straw cwt.	Grain bus.	Straw cwt.
1	None	6.2	16.8	18.9	23.8	20.7	22.9	27.9
2	10 tons dung to wheat	10.9	20.9	21.3	30.7	24.0	27.2	32.1
3	10 tons dung to wheat, 5 cwt. super. and 1 cwt. nitrate of soda to roots	15.6	23.8	23.6	35.9	29.8	30.0	35.3
4	10 tons dung and 1 cwt. nitrate of soda to wheat, 5 cwt. super. to roots	14.2	24.0	22.7	38.0	29.5	36.8	45.9

In this example, the improvement due to dung, though marked on all crops, is not so spectacular, and the addition of

PRICES OF ARTIFICIAL MANURES

Average prices per ton during week
ended October 5

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	8 9	8 9	8 9	8 9	10 11
" " Granulated (N. 16%) ..	8 9	8 9	8 9	8 9	10 7
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	5 5d	5 5d	5 5d	5 5d	5 1
Calcium cyanamide (N. 20·6%)	6 17s	6 17s	6 17s	6 17s	6 8
Kainit (Pot. 14%) ..	3 7	3 2	2 19	3 4g	4 7
Potash salts (Pot. 30%) ..	5 7	5 3	5 1	5 5g	3 6
" (Pot. 20%) ..	3 16	3 13	3 9	3 14g	3 8
Muriate of potash (Pot. 50%) ..	9 19	9 12	9 4	9 14g	3 11
Sulphate " (Pot. 48%) ..	11 14	11 9	11 4	11 12g	4 10
Basic slag (P.A. 15½%)||	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)||	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock-phosphate (P.A. 26-27½%)||	2 10a	2 8a	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%) ..	3 2	..	3 4	2 16k	3 6
" (S.P.A. 13½%) ..	2 17	2 9	3 0	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	6 10	6 5	7 5	6 7	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 15	5 2f	6 0	5 0	..

Abbreviations : N. = Nitrogen ; P.A. = Phosphoric Acid ; S.P.A. = Soluble Phosphoric Acid ;
Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‡ Fineness 85% through standard sieve.

§ Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails ; southern rails, 2s. 6d. extra.

¶ Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station.

f Delivered Yorkshire stations.

g Prices shown are f.o.r. northern rails ; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails ; southern rails, 1s. 8d. extra.

* * * * *

extra phosphate to the roots gives a considerable lift to the whole rotation.

In an experiment at Kilmarnock, carried out on a rotation of crops in the years following 1907, the results were somewhat different. The soil is light and the rainfall is heavy and, under these conditions, the residual effects of a moderate dressing of dung, either alone or supported by artificials, were not marked. The yields expressed on the basis of 100 for the unmanured plots were as follows :—

KILMARNOCK : AVERAGE OF 10 PLOTS.							
<i>Manuring</i>				<i>Potatoes</i>	<i>Wheat</i>	<i>Seeds</i>	<i>Oats</i>
None	..	..	..	100	100	100	100
10 tons of dung to potatoes	..			140	97	97	99
10 tons of dung and 6½ cwt. artificials to potatoes	..			168	104	114	99
				<i>Turnips</i>	<i>Wheat</i>	<i>Seeds</i>	<i>Oats</i>
None	..	..	..	100	100	100	100
10 tons of dung to turnips	..			140	107	92	94
10 tons of dung and 4½ cwt. artificials to turnips	..			158	107	92	95

All the above experiments serve to show the value of dung in raising the level of the rotation. On certain soils, dung alone raises the general level to a point at which additional fertilizers make no spectacular improvement in yield although the quality of hay, and probably of other crops, is improved. Where phosphate is deficient, moderate dunging does not produce maximum crops and additional phosphate has great value. There is evidence that, on open soils in wet districts, most of the action of farmyard manure is to be sought in the crop to which it is applied.

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NOTES ON FEEDING

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Maize as a Green Fodder Crop.—There is nothing new in the cultivation of maize for green fodder in this country. It has been grown to some extent in the Southern Counties for many years, but it is a practice that might be more fully explored in the Midlands and other districts not subjected to specially late frosts in early summer, nor early frosts in autumn. The main object of growing maize in the British Isles is the production of a green fodder crop for use in the latter end of the summer, when grass may not be abundant. In a dry season, green maize comes in very useful for feeding to dairy cows, particularly when pastures have been scorched and burnt, as it

produces a wealth of green succulent material that helps appreciably to maintain the milk yield. It may also be used as keep for sheep folded on the growing crop. It has been said that the popularity of silage in America is in great part due to the large bulk of green maize that can be grown per acre for making into silage.

Maize has been grown on the Moulton Experimental Farm for the last three years, and yields at the rate of some 40 tons per acre have been obtained. To give a yield of this amount, maize must obviously be a very gross feeder, and so far as our experience goes the main point in securing a heavy yield is to have the soil in rich condition as regards organic matter. With attention paid to this provision, maize has done well on the same land three years in succession. The soil is a warm, well-drained sandy loam. Seed of the American White Horse-tooth or Giant Caragua variety was drilled towards the end of May in each of the three years (in 1932, on May 31), at the rate of 2 bushels per acre in rows 24 in. apart. The land was hoed from time to time in the early growing period, and a start was made in using the crop at the middle of August. On September 1, when the crop was about 9 to 10 ft. high, a check weighing was made, and the weight per acre worked out at $41\frac{1}{2}$ tons. The maize was fed to cattle indoors—the stock bull, calves, etc.—and to sows suckling litters; it was also carted on to the pasture for the dairy cows to eat after the afternoon milking.

Cattle prefer the leaf to the stem, and when the stem becomes somewhat fibrous they are inclined to leave it uneaten. To overcome this difficulty, it is best to feed the maize in the early stage before the stem becomes woody. An alternative is to put the stuff through a chaff cutter and chop it into short lengths. When this is done, it should be fed in the cows' manger after milking. Maize is not specially laxative. The cows' dung remained normal when they were receiving maize, but when the maize was finished, and they were changed on to mixed thousand-head and marrow-stem kale, it was observed that the kale had a more loosening effect.

As regards manuring and preparation of the land for the crop, experience indicates the importance of giving a liberal dressing of farmyard manure, ploughed in during the previous winter or spring. The quantity of dung per acre required will naturally vary with the circumstances, but a suitable average dressing would be about 10 tons. Certain growers recommend an additional all-round dressing of artificials, but provided the

land is in a good state of fertility, and well supplied with humus, no artificials may be necessary.

Given a fine, firm seed bed, the principal consideration as regards sowing the seed is that the seedlings are susceptible to both cold and frost. Therefore in the Midlands, in any event, it is preferable to postpone drilling until towards the end of May, and to drill the seeds a little deeper than with cereals. With warm conditions in June, and a sufficient supply of moisture, the crop grows rapidly. Rooks have a great liking for maize grains, and the rather deeper sowing may help to protect the seeds to some extent from rooks, but additional measures may be necessary.

It is advisable to have the crop off the ground before frosts set in, as it is easily damaged by frost. It is possible, however, to have about a month's supply of green fodder, say, from the second half of August until the second half of September. In view of the large bulk that can be obtained per acre, and of the fact that green stuff frequently comes in very useful in the period mentioned, it is a little surprising that maize is not more widely grown. Some twenty years ago, Prof. M. J. R. Dunstan drew attention to its possibilities, and suggested the need for trials to determine the relative cropping capacities of different kinds of maize under British conditions, but little appears to have been done in this connexion. Green maize is a well-balanced fodder for cows and other classes of stock, while the high yield per acre that may be obtained is an additional attraction. Even a small area gives a considerable bulk of stuff.

Feeding Dry Cows in Winter.—A few years ago much interest was taken in the preparation of cows for their lactation, a process for which the term "steaming-up" was coined. When careful attention was given to this matter, there can be little doubt that the subsequent yields of the cows were improved. Human nature, however, is liable to weary in well doing, and observation seems to indicate that the practice of carefully preparing the cow for her lactation is lapsing, and now hardly receiving the attention it deserves.

If we take 45 weeks as the normal length of the lactation of a cow that is due to calve again one year after her previous calving, this allows a rest of seven weeks, but however carefully we may try to have cows calving at yearly intervals, we know that for various reasons there are really very few that conform to the requirement in this respect.

It is stated by Sanders that the period of rest is of importance in allowing the cow's milk gland to recover its full functional capacity, and that normally about seven weeks are sufficient for this process of recuperation to take place. Consequently, there is little or nothing to be gained by deliberately lengthening the period of rest beyond about seven weeks. Moreover, during the rest period, the cow should build up a reserve of body substance, or "condition," in preparation for the drain of the forthcoming heavy yield of milk. To do so, she must be suitably fed and provided with nutriment over and above that required to maintain body heat, to make good the normal wear and tear, and to nourish the unborn calf. In addition, the feeding should be such as to redress any adverse balance of the food materials fed during the previous lactation. In this connexion, however, the feeder is still, to a considerable extent, groping in the dark, and provision to redress any possible adverse balance can only be made on broad and general lines.

On the Moulton farm we have found, by periodical weighings, taken over a number of seasons, that dry in-calf stock, on grass and lying out, increase in weight up to about the end of October, more or less maintain weight in November, and from then onwards lose weight unless they receive food in addition to the grass. Therefore we may take it that on the sort of land which is just below being first class, it will be advisable to feed some extra food from late October or the beginning of November onwards. Where the feeding value of the land is not so good as that described above, it may be necessary to provide the extra food earlier.

As regards the nature of concentrated food to be fed to in-calf cows, Boutflour has recommended that it should have much the same composition as a suitable milk-producing ration. He has commended certain foods, such as palm kernel cake, and for certain reasons deprecated the use of cotton cake. A suitably balanced dairy nut or cube has advantages on the grounds of convenience and absence of waste, and further it is possible to obtain a dairy nut containing mineral matter which, being mixed with the other ingredients, is thus in convenient form for feeding. Home-grown crushed beans and oats, say in the proportions 2 : 1½, or 2 : 1, answer very well. Palm kernel cake alone, or palm kernel cake in any proportion together with maize gluten feed and oats in equal proportions, forms a suitable and economical food ; there are, however, many suitable mixtures. In regard to the quantity

to be fed per head, this must depend upon the feeder's judgment and be determined by the condition of the animals. Extravagant feeding with concentrates, however, is not likely to be justified by results. For in-calf stock lying out on reasonably good grass, 3 lb. per head per day, increasing to, say, 5 lb., could be taken as a fair guide.

Again, it should be remembered that good quality hay is a sound milk-producing food, and that a sufficient allowance of good hay may be all that is required. As regards roots, one has to bear in mind that roots contain a high percentage of water, and that for feeding to cows or in-calf heifers lying out at night, in cold weather, the water in the roots may have a somewhat chilling and deleterious effect. Swedes are not regarded favourably for feeding to in-calf stock, either cows or ewes, except in moderate quantity and when given in conjunction with an allowance of dry fodder. Fed in this way roots may have a specially beneficial effect in keeping cows in a laxative state, when otherwise they might become somewhat constipated.

As regards the possible adverse balance of any particular nutrients, it seems safe to conclude that cows that have spent the summer on good grass land that has been treated with basic slag or other suitable artificial manures, are not likely to suffer from serious deficiency of any particular food constituent. Good hay obtained from grass land of this description should provide valuable mineral matter. On the other hand, in the absence of hay from healthy land, and in order to take the line of safety, it may be prudent to provide minerals in the food.

* * * * *

DESCRIPTION	Price per qr.		Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch	Price per lb. starch	Pro- tein equiv.
	s. d.	lb.	£ s.	£ s.	£ s.	100 lb. equiv.	s. d.	d.	%
Wheat, British	—	—	6 0	0 9	5 11	72	1 6	0-80	9-6
Barley, British feeding ..	—	—	6 0	0 7	5 13	71	1 7	0-85	6-2
" Canadian No. 3 Western ..	21 0	400	5 18	0 7	5 11	71	1 7	0-85	6-2
" Australian	28 6	"	7 8	0 7	7 1	71	2 0	1-07	6-2
" Danubian	21 6	"	6 0	0 7	5 13	71	1 7	0-85	6-2
" Persian	20 3	"	5 13*	0 7	5 6	71	1 6	0-80	6-2
" Russian	20 0	"	5 12*	0 7	5 5	71	1 6	0-80	6-2
Oats, English white	—	—	6 13	0 7	6 6	60	2 1	1-12	7-6
" black and grey	—	—	6 10	0 7	6 3	60	2 1	1-12	7-6
" Canadian No. 2 Western ..	22 3	320	7 15	0 7	7 8	60	2 6	1-34	7-6
" feed	13 9	"	4 17	0 7	4 10	60	1 6	0-80	7-6
" Argentine	19 3	"	6 15	0 7	6 8	60	2 2	1-16	7-6
Maize, Argentine	22 0	480	5 3	0 7	4 16	78	1 3	0-67	7-6
Beans, English winter	—	—	6 0	0 17	5 3	66	1 7	0-85	19-7
Peas, English blue	—	—	15 10*	0 14	14 16	69	4 3	2-28	18-1
" Indian	—	—	9 0*	0 14	8 6	69	2 5	1-20	18-1
" Japanese	—	—	28 0*	0 14	27 6	69	7 11	4-24	18-1
Milling offals—	—	—	—	—	—	—	—	—	—
Bran, British	—	—	6 0	0 17	5 3	43	2 5	1-29	9-9
" broad	—	—	6 10	0 17	5 13	43	2 8*	1-43	10
Middlings, fine imported ..	—	—	6 17	0 12	6 5	69	1 10	0-98	12-1
" coarse British	—	—	6 7	0 12	5 15	56	2 1	1-12	10-7
Pollards, imported	—	—	5 15	0 18	4 17	62	1 7	0-85	11
Meal, barley	—	—	8 2	0 7	7 15	71	2 2	1-16	6-2
" barley, grade II	—	—	7 7	0 7	7 0	71	2 0	1-07	6-2
" maize	—	—	6 2	0 7	5 15	78	1 6	0-80	7-6
" " South African	—	—	5 15	0 7	5 8	78	1 5	0-76	7-6
" " germ	—	—	6 2	0 11	5 11	79	1 5	0-76	8-5
" locust bean	—	—	6 5	0 6	5 19	71	1 8	0-89	3-6
" bean	—	—	8 0	0 17	7 3	66	2 2	1-16	19-7
" fish	—	—	14 10	2 8	12 2	59	4 1	2-19	53
Maize, cooked flaked	—	—	7 0	0 7	6 13	84	1 7	0-85	9-2
" gluten feed	—	—	6 5	0 12	5 13	76	1 6	0-80	19-2
Linseed cake, English, 12% oil ..	—	—	8 15	1 0	7 15	74	2 1	1-12	24-6
" " " 9% "	—	—	8 10	1 0	7 10	74	2 0	1-07	24-6
" " " 8% "	—	—	8 5	1 0	7 5	74	2 0	1-07	24-6
Cottonseed cake—	—	—	—	—	—	—	—	—	—
English, 4½% oil	—	—	5 15	1 0	4 15	42	2 3	1-20	17-3
Egyptian, 4½% oil	—	—	5 7	1 0	4 7	42	2 1	1-12	17-3
Decorticated cottonseed cake ..	—	—	—	—	—	—	—	—	—
" " 7% oil	—	—	8 5*	1 9	6 16	68	2 0	1-07	34-6
" " 7% oil	—	—	8 7*	1 9	6 18	68	2 0	1-07	34-6
" ground-nut cake, 6-7% oil ..	—	—	8 7	1 6	7 1	73	1 11	1-03	41-3
Palm-kernel cake, 4½-5½% oil ..	—	—	6 7*	0 12	5 15	73	1 7	0-85	16-9
" " " meal, 4½% oil ..	—	—	6 17*	0 12	6 5	73	1 9	0-94	16-9
" " " meal, 1-2% oil ..	—	—	5 17	0 12	5 5	71	1 6	0-80	16-5
Feeding treacle	—	—	5 0	0 8	4 12	51	1 10	0-98	2-7
Brewers' grains, dried ale	—	—	6 0	0 12	5 8	48	2 3	1-20	12-5
" " " porter	—	—	5 10	0 12	4 18	48	2 1	1-12	12-5
Malt culms	—	—	7 10	1 0	6 10	43	3 0	1-61	16

* At Bristol.

† At Liverpool.

‡ At Hull.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of September, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, readily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton then since its manurial value is 20s. per ton as shown above, the food value per ton is 5s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 6d. Dividing this again by 22-4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1-12d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff given him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 5s. 1d.; P, 0s. 1d.; K, 0s. 1d.; S, 0s. 1d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	6 2
Maize	78	7.6	5 3
Decorticated ground-nut cake ..	73	41.3	8 7
" cotton cake	68	34.7	8 5

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.47 shillings, and per unit protein equivalent, 1.91 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

In accordance with the recommendation of this Committee the "food values" given in the following table may be taken as applicable to the ensuing four months, December to March, inclusive, for the purposes of advisory schemes on the rationing of dairy cows.

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Roots—			
I'ohl Rabi	8	0.5	0 13
Mangolds	7	0.4	0 11
Potatoes	18	0.8	1 8
Swedes	7	0.7	0 12
Turnips	4	0.4	0 7
Green foods—			
Cabbage, drumhead	7	0.9	0 12
" open-leaved	9	1.5	0 16
Kale, marrow stem	9	1.3	0 16
Silage, vetch and oats	13	1.6	0 22
Hay—			
Clover hay	38	7.0	3 9
Lucerne hay	29	7.9	2 18
Meadow hay, poor	22	2.9	1 18
" " good	37	4.6	3 3
" " very good	48	7.8	4 5
Seeds hay	29	4.9	2 12
Straws—			
Barley straw	23	0.7	1 15
Bean straw	23	1.7	1 17
Oat straw	20	0.9	1 11
Wheat straw	13	0.1	0 19
Grains and seeds—			
Barley	71	6.2	5 16
Beans	66	19.7	6 15
Oats	60	7.6	5 3
Peas	69	18.1	6 16
Wheat	72	9.6	6 4

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 6d. net.

MISCELLANEOUS NOTES

As compared with a month earlier, the index numbers for most descriptions of live stock in September were lower and there were reductions also in wheat and oats. On the other hand there was an appreciable rise in the index for barley and smaller increases in milk, eggs and potatoes, while on balance the general level of the prices of agricultural produce showed a decline of one point to 104. At the corresponding period of 1931 the index receded from 121 to 120.

Monthly index number of prices of Agricultural Produce. (Corresponding months of 1911-13=100.)

Month	1927	1928	1929	1930	1931	1932
January	149	145	145	148	130	122
February	145	143	144	144	126	117
March	143	145	143	139	123	113
April	143	151	146	137	123	117
May	142	154	144	134	122	115
June	141	153	140	131	123	111
July	142	145	141	134	121	106
August..	142	144	152	135	121	105
September	143	144	152	142	120	104
October	140	139	142	129	113	
November	137	141	144	129	112	-
December	138	140	143	126	117	-

Grain.—The index for wheat was 4 points lower on the month at 76, while for oats there was a drop of 10 points to 96. In the case of barley, however the index appreciated by 13 points to 103, which was due primarily to the freer marketing of new crop grain. In September, 1931, the index for barley was 118 or 18 points higher than in the previous month.

Live Stock.—Except in the case of porkers, the index figure for which was unchanged at 87, lower levels were recorded for fat stock. Fat cattle dropped by 6 points to 112, sheep by 4 points to 86 and bacon pigs by 2 points to 84. As regards store stock, dairy cows were a little higher at 112, but the indices for store cattle and sheep were rather lower at 109 and 80, respectively, while store pigs were unaltered at 86.

Dairy and Poultry Produce.—The average contract price of milk was a trifle higher in September than in August, and the index figure showed a rise of 2 points to 150. Butter, however, was 6 points lower at 94 while cheese declined by 9 points to 116. The seasonal rise in egg prices was rather more marked than a year ago and the index number rose by 9 points to 124, as against a level of 120 a year earlier.

Other Commodities.—The index for potatoes was 8 points higher on the month at 114, but at the corresponding period of

1931 a rise of 40 points to 185 was recorded. Hay and wool showed little change at 69 and 62, respectively. As regards apples and plums, the index numbers of about 200 and 270, respectively, continued at levels in excess of those recorded a year ago, while the index for pears was 133 as against nearly 100 in September, 1931.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13=100.)

Commodity	1930	1931	1932			
	Sept.	Sept.	June	July	Aug.	Sept.
Wheat	97	63	80	79	80	76
Barley	103	118	93	94	90	103
Oats	88	83	107	101	106	96
Fat cattle	135	122	118	117	118	112
„ sheep	162	131	107	97	90	86
Bacon pigs	133	90	91	87	86	84
Pork „	144	102	91	86	87	87
Dairy cows	131	120	116	112	110	112
Store cattle	127	123	115	113	113	109
„ sheep	169	133	98	90	81	80
„ pigs	207	129	85	84	86	86
Eggs	136	120	102	114	115	124
Poultry	140	130	132	119	117	124
Milk	200	157	137	143	148	150
Butter	124	107	96	104	100	94
Cheese	122	108	153	131	125	116
Potatoes	151	185	213	134	106	114
Hay	111	86	69	66	68	69
Wool	92	70	57	58	61	62

* * * * *

THE Lands Improvement Company have notified the Ministry that their rates of interest in respect of approved applications for loans have been reduced from $4\frac{1}{2}$ per cent. net to $4\frac{1}{8}$ per cent. net in the case of loans of £500 and upwards, and from $4\frac{3}{4}$ per cent. net to $4\frac{1}{8}$ per cent. net for loans of less than £500.

The Improvement of Land Acts enable owners of land, with the sanction of the Ministry, to borrow money for agricultural and other improvements, and to charge the cost of the works upon the lands improved. A leaflet (No. A.749/L.I.) explaining the facilities available under the Acts and setting out a list of the improvements which may be the subject of a charge may be obtained gratis and post free from the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, S.W. 1.

SINCE the date of the list published in the July, 1932, issue of this JOURNAL (p. 389), the undermentioned Advisory Leaflets have been issued by the Ministry.

Advisory Leaflets

The leaflets starred are re-issues, without substantial revision, of leaflets in the old series and have not, therefore, been circulated to leaflet subscribers under the scheme set out in the December, 1930, issue of this JOURNAL. Copies of any or all of the starred leaflets will, however, be supplied free and post free to any leaflet subscriber who makes application.

- No. 114. The Control of Fruit Pests in Gardens and Small Orchards.
- No. 118. The Management of Milch Goats.
- No. 119. Stack Thatching.
- No. *120. Broom-Rape.
- No. 123. Seeds Mixtures for Grassland and some Directions for Laying Down to Grass.
- No. 124. Pruning of Stone Fruit Trees.
- No. 125. Duck Keeping for Egg Production and Table.
- No. 126. Pea and Bean Beetles.
- No. 127. Cultivation of Cucumbers.
- No. 128. Turkeys.
- No. 129. Loganberry Cultivation.
- No. 130. Carnations.
- No. 131. The Production of Mutton and Lamb.
- No. *132. Ringworm in Cattle.
- No. 133. Small-Holder Cheese.
- No. 134. Improvement of Poor Upland Pasture.
- No. 135. Hints on the Feeding of Dairy Cows.
- No. *136. Lancashire Cheese.
- No. *137. Glanders and Farcy.
- No. 138. Back Yard Poultry Keeping.
- No. 139. Mosaic and Allied Diseases of the Potato.
- No. 140. Cleanliness in Dairying.
- No. 141. Caerphilly Cheese.
- No. 142. Cheshire Cheese.
- No. 145. Fowl Pox.
- No. 148. Foot-and-Mouth Disease.

* * * * *

Foot-and-Mouth Disease.—Since the notification published in the last (October) issue of this JOURNAL, outbreaks of foot-and-mouth disease have been confirmed at Combe Martin, Devon, on October 3, and near Mold, in Flintshire, on October 5, 1932. The usual restrictions were imposed in each case upon an area surrounding and extending to a distance of about 15 miles from the infected premises.

* * * * *

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS ENGLAND

Northants : Mr. W. J. England, N.D.A., has been appointed Assistant Dairying Instructor, *vice* Mr. D. MacKellar.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1932

PRODUCE OF HOPS

PRELIMINARY STATEMENT SHOWING THE ESTIMATED TOTAL PRODUCTION OF HOPS IN THE YEARS 1932 AND 1931, WITH THE ACREAGE AND ESTIMATED AVERAGE YIELD PER STATUTE ACRE IN EACH COUNTY OF ENGLAND IN WHICH HOPS WERE GROWN, AND THE AVERAGE YIELD PER ACRE OF THE TEN YEARS 1922-1931.

Counties, etc.		Estimated total produce		Acreage returned on June 4		Estimated average yield per acre	
		1932	1931	1932	1931	1932	1931
						Average of the 10 years 1922-1931	
		Cwt.	Cwt.	Acres	Acres	Cwt.	Cwt.
Kent	East ..	28,300	28,300	1,921	2,556	14.7	11.1
	Mid ..	31,800	30,500	2,549	3,550	12.5	8.6
	Weald ..	55,300	53,000	4,507	5,388	12.3	9.8
	Total Kent	115,400	111,800	8,977	11,494	12.9	9.7
Hants ..		7,000	2,800	520	751	13.3	3.7
Surrey ..		800	300	83	146	9.6	2.3
Sussex ..		13,900	13,300	1,195	1,453	11.6	9.1
Hereford ..		32,300	28,300	3,864	3,817	8.4	7.4
Worcester ..		17,800	11,900	1,828	1,811	9.7	6.6
Other counties*		800	600	64	56	11.5	10.8
Total ..		188,000	169,000	16,531	19,528	11.4	8.7

* Salop, Gloucester, and Berkshire.

Note.—The acreage under hops has continued to shrink, the area returned on June 4, 1932, showing a further reduction of 3,000 acres. The greater part of this reduction occurred in Kent which returned 2,500 acres less than in 1931. The area left unpicked this year, however, was estimated to be only about 200 acres as compared with 1,600 acres in 1931. The yield per acre, although nearly 1 cwt. under average, was appreciably better than that obtained last year, and in consequence, notwithstanding the reduced acreage, the total estimated production of 188,000 cwt. was 19,000 cwt. more than in 1931.

All hop-growing counties showed an improved yield per acre, which varied from 8.4 cwt. in Hereford to 13.3 cwt. in Hants. In Kent, which returned more than one half of the hop acreage, the yield per acre was 12.9 cwt., as compared with 9.7 cwt. last year and a ten years' average for the county of 13.1 cwt. The yield per acre in Hants was 13.3 cwt. as compared with the very low yield of 3.7 cwt. in 1931 and an average for the county of 11 cwt. The yield in these two counties was above the ten years' average for the whole of the hop-growing area in the country. In Surrey, Sussex and Hereford, the yield per acre was under the local average, although well above the yield obtained last year. In Surrey 9.6 cwt. per acre was secured as against 2.3 cwt. per acre in 1931 when the crop was practically a failure. Sussex obtained 11.6 cwt.

compared with 9·1 cwt. last year, while Hereford obtained 8·4 cwt. per acre or 1 cwt. per acre more than in 1931.

On the whole the hop-growing season this year was not unsatisfactory. The weather was unfavourable in the early part of the season and downy mildew and insect pests were rather prevalent. Conditions improved considerably, however, at the later stages and the quality of the crop is generally considered to be good.

* * * * *

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W. 1, on Monday, September 19, 1932, the Rt. Hon. Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders :—

Gloucestershire.—An Order continuing (with a modification in respect of the week in which Christmas Day falls) the operation of the existing minimum and overtime rates of wages from October 2, 1932, until October 7, 1933. The minimum rates in the case of male workers of 21 years of age and over are as follows :—

Head Carters.—In winter 34s. 2½d. per week of 52½ hours in the week in which Boxing Day falls and 60 hours in any other week. In summer 32s. 9½d. per week of 51 hours in the week in which Good Friday falls and 58 hours in any other week.

Under Carters.—In winter 32s. 9½d. per week of 50½ hours in the week in which Boxing Day falls and 57 hours in any other week. In summer 30s. 10½d. per week of 48 hours in the week in which Good Friday falls and 54 hours in any other week.

Head Shepherds or Head Stockmen.—34s. 2½d. per week of 52½ hours in the weeks in which Boxing Day and Good Friday fall and 60 hours in any other week.

Under Shepherds or Under Stockmen.—32s. 9½d. per week of 50½ hours in the weeks in which Boxing Day and Good Friday fall and 57 hours in any other week.

Other male workers.—28s. 6d. per week of 39½ hours in the week in which Boxing Day falls, 48 hours in any other weeks in winter, 41 hours in the week in which Good Friday falls and 50 hours in any other week in summer.

The overtime rates for all classes of male workers of 21 years of age and over are 8½d. per hour on weekdays and 10½d. per hour on Sundays, Boxing Day and Good Friday.

In the case of female workers the minimum rate is 4½d. per hour irrespective of age for all time worked.

Oxfordshire.—An Order continuing (with a modification in respect of the week in which Christmas Day and Boxing Day fall) the operation of the existing minimum and overtime rates of wages from September 25, 1932, until December 31, 1932. The minimum rates of wages in the case of male workers of 21 years of age and over are 28s. per week of 31 hours in the week in which Christmas Day and Boxing Day fall, 48 hours in any other week in winter and 50 hours in any week in summer with overtime at 8d. per hour on weekdays and 10d. per hour on Sundays, Christmas Day, Boxing Day and the day following Boxing Day. In the case of female workers of 18 years of age and over the minimum rate is 6d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays, Christmas Day, Boxing Day and the day following Boxing Day.

Shropshire.—An Order cancelling the existing minimum and overtime rates of wages as from October 1, 1932, and fixing fresh rates to come into operation as from October 2, 1932. The minimum rates in the case of male workers of 21 years of age and over are 30s. (instead of 31s. 6d. as at present) per week of 44½ hours in the weeks in which Christmas Day falls in 1932 and 1933 and in the week in which Good Friday falls in 1933, and 54 hours in any other week, with overtime at 9d. per hour except for overtime employment on Sundays (other than employment in connexion with the necessary care of and attention to livestock, including milking) for which the rate is 10d. per hour. In the case of female workers of 18 years of age and over, the minimum rate is 5d. per hour with overtime at 6d. per hour for employment on Sundays, Christmas Day and Good Friday.

Anglesey and Caernarvon.—An Order fixing minimum and overtime rates of wages for male workers employed for time work in forestry (i.e., employment in connexion with preparing land, planting and maintaining forestry areas, and nursery work in connexion therewith) to come into operation on October 2, 1932. The minimum rate for male workers of 21 years of age and over is 35s. per week of 50 hours with overtime at 9d. per hour.

Pembroke and Cardigan.—An Order fixing minimum and overtime rates of wages to come into operation on October 1, 1932 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until September 30, 1933. The minimum rates in the case of male workers of 21 years of age and over are 30s. (instead of 31s. as at present) per week of 52 hours in winter and 54 hours in summer, with overtime on weekdays and on Sundays at 8d. per hour (instead of 9d. per hour as at present). In the case of female workers of 18 years of age and over the minimum rates are 5d. per hour for 8 hours a day throughout the year with overtime payment on weekdays at 6d. per hour and on Sundays at 6½d. per hour for the first three hours and 7½d. per hour for subsequent hours.

Copies of the Orders in full may be obtained on application to the Secretary of the Agricultural Wages Board.

* * * * *

Enforcement of Minimum Rates of Wages.—During the month ended October 14, legal proceedings were instituted against six employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County	Court	Fines imposed			Costs allowed			Arrears of wages ordered			No. of workers involved
		£	s.	d.	£	s.	d.	£	s.	d.	
Berks ..	Wallingford	20	0	0	3	3	0	23	3	10	1
Lincoln—											
Lindsey	Lincoln	1	0	0	0	7	6	6	18	4	2
Northumber-											
land ..	Amble	—			6	4	0	14	16	6	1
Warwick ..	Milverton	1	0	0	—			5	0	0	2
Warwick ..	Solihull	3	0	0	1	18	0	24	11	10	3
Denbigh ..	Cerrig-y-										
Druidion		*			—			—			2
		25	0	0	11	12	6	74	10	6	11

* Case dismissed.

NOTICES OF BOOKS

Lucerne (*Die Luzerne*). By Dr. O. E. Heuser. Pp. viii+228 and 70 figs. (Berlin: Paul Parey, 28 and 29 Hedemannstrasse, S.W.11. 1931. Price 12'50RM.)

Lucerne holds a position unique in interest amongst the leguminous crops of the world, both by reason of its valuable qualities and also because of the problems that have arisen from the recent very rapid spread of its cultivation into almost every country in the world. There exist a number of books dealing with the cultivation of lucerne from the point of view of individual countries, but a treatise dealing with the plant from a botanical and ecological standpoint has been much needed. Professor Heuser's book adequately fills this gap. It gives a good résumé of modern work on lucerne and contains a considerable amount of original material. The first portion of the book deals with the botanical position and varieties of lucerne and with the spread and present geographical distribution of its cultivation. This is followed by a detailed description of the parts and habit of growth of the plant. The second half of the book discusses the effect of soil conditions and manurial treatment on the crop, and the methods of its cultivation and utilization. The methods and results obtained with "inoculation" in the various countries might be dealt with at great length in a future edition, since this process has a peculiar importance in the case of lucerne on account of its recent introduction into many new districts where the soil does not contain the appropriate variety of nodule organism. The book is very well illustrated and contains plentiful references to original papers, the titles of which, however, are sometimes translated into German and sometimes left in the original language.

Soils: Their Origin, Constitution and Classification.—An Introduction to Pedology. By G. W. Robinson. Pp. xv+290 and 12 figs. (London: Thomas Murby & Co., 1 Fleet Lane, E.C.4. 1932. Price £1.)

In most English text books on soils the emphasis is on the soil as the medium for plant growth, for soil science developed here almost entirely as a branch of the applied science of agricultural chemistry. The increasing recognition of the important genetic principle, first established by the Russian workers, that soils have common relationships based on similarities in the conditions under which they are formed, has given a new orientation to the study of soils and prepared the way for treating soil science as an independent branch of natural science generally known as "pedology." When soil research and schemes of classification based on "the soil itself, using the profile as the unit of study," are more fully developed, the science of pedology should serve agriculture in the way in which geology serves mining and civil engineering. At first sight the newer methods seem academic and remote from practice, but they are already justifying themselves here and still more strikingly in the overseas Empire.

The volume under review is noteworthy as being the first English text-book that treats the subject "philosophically," accepting from the outset the pedological viewpoint. In consequence, many branches of the subject, such as the soil-forming processes, the clay complex and base exchange, are treated fully, whereas soil microbiology, plant nutrition, and soil cultivation are designedly discussed briefly.

The outstanding merit of the book is in its description of concrete examples of soils from all over the world and their grouping on genetic principles without any uncritical acceptance of current schemes of classification.

The chapters on the methods of soil survey and soil analysis and the principles of soil classification are especially to be commended. All

soil specialists are familiar with Professor Robinson's important original contributions to these subjects and will appreciate the opportunity of having them reviewed in relation to the fundamental problems from which they arose.

The book is well printed and indexed, but—for a book of its character and price—poorly illustrated. The only photograph of a soil profile fails through defective reproduction to bring out the essential features of the soil type illustrated, and there are no diagrams to show the main characteristics and conditions of formation of the major soil groups.

German Agriculture from National and International Standpoints (*Die deutsche Landwirtschaft unter volks und weltwirtschaftlichen Gesichtspunkten*). Edited by M. Sering. Pp. lii+954 and 66 pp. tables, 10 maps and 59 text diagrams. (Berlin: Paul Parey, 28 and 29 Hedemannstrasse, S.W.11. 1932. Price 84RM. Postage 2.40RM. extra.)

This massive volume on German agriculture will naturally make a stronger appeal to the German reader than to agriculturists in this country. Our leaders of agricultural policy, however, would do well to read it with the minutest care and ponder well over the problems that are discussed and the proposals that are put forward for ameliorating the position of agriculture in Germany. The agricultural story of Great Britain has many features in common with that of Germany. In both countries the farmer has had to fight hard to maintain himself in the face of an ever-growing industrialism. In both countries, also, the changed conditions of the post-war world have heaped up new and baffling problems to aggravate his already hard lot. In this impressive treatise, which has been compiled with the care and comprehensiveness so frequently characteristic of German publications, these matters, in so far as they relate to German agriculture, have been reviewed and discussed by Professor Sering and his numerous distinguished collaborators. The British agriculturist has everything to gain by paying heed to what they have to say.

It would be quite hopeless, within the limits of a short notice, to attempt anything like a detailed consideration of this publication, of which the summary of contents alone stretches over some thirty pages. It must suffice, therefore, to indicate its aim and scope by the following quotation translated from the introductory section: "Is it possible to produce at home the necessary means of subsistence for the 65 millions of Germans living within our narrowed and sundered boundaries? Can the German farmer hold out against the competition of more extensive countries without the protection of a high tariff, which in the long-run makes competition in foreign markets impossible for an industrial community, that, since the war, is the poorest in the world in respect of raw materials? Can German agriculture keep pace with the farming industry in neighbouring lands, where capital can be borrowed at half the rate of interest obtaining in this country? By what measures can the provision of the German people with home-produced agricultural commodities be increased, improved and cheapened? Agricultural depression reigns not only in Germany, but also, although seldom in such an intense degree, throughout almost the whole world, and at the same time there exists an industrial depression involving millions of unemployed. How are these phenomena related? Has it to do with the failure of the 'capitalistic system' and is the problem to be solved by the methods adopted in Russia?"

The treatise is divided as follows into eight big sections: I.—Position of agriculture in Germany before, during and after the war; II.—Survey of agricultural conditions in Germany; III.—Changes in the conditions of production and trading since the end of the war; IV.—

The development of German agriculture and its adaptation to the altered conditions ; V.—The position of farming in the unfavourable provinces of Germany and the means for preserving the industry in these regions ; VI.—The present position and prospects of the separate branches of the farming industry ; VII.—Measures for the encouragement of German agriculture ; VIII.—The past and the future. At the end of the book are included several large and beautifully coloured charts relating to the subject matter in the text.

It will be observed that the interest of the book is very varied, making an appeal alike to the agricultural scientist, economist, historian and administrator. It might also be profitably studied by British Members of Parliament who represent agricultural constituencies.

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- An Experiment in the Interpretation of Farm Profits. *E. Whittaker*. (Scottish Jour. Agric., xv, 3 (July, 1932), pp. 320–329.) [338.1.]
- Land Settlement in Scotland : I. (Scottish Jour. Agric., xv, 3 (July, 1932), pp. 245–252.) [325 (41) ; 333.38 (41).]
- Labour Requirements of Crops on Welsh Farms. *J. Llefelys Davies*. (Welsh Jour. Agric., viii (1932), pp. 26–36.) [331 ; 63.191.]
- Broadcasting as an Instrument of Instruction and Propaganda in Rural Life. (Int. Rev. Agric. (Mon. Bull. Agric. Econ. and Soc.), xxiii, 7 (July, 1932), pp. 187–198.) [371.]
- Notes on the Occurrence of Buried Seeds in the Soil. *H. G. Chippindale* and *W. E. J. Milton*. (Jour. Agric. Sci., xxii, 3 (July, 1932), pp. 451–452.) [63.1951.]
- The Eradication of Bracken. *M. Griffith*, *W. Evans* and *E. E. Williams*. (Welsh Jour. Agric., viii (1932), pp. 229–232.) [63.259.]
- Der Schlepper in der Landwirtschaft seine Wirtschaftlichkeit und Weltwirtschaftliche Bedeutung. *N. Jasny*. (Ber. über Landw., 62 Sonderheft (1932), pp. 1–155.) [63.175.]
- A Test of a New Type of Force-Feed Cereal Drill. *C. Davies*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 102–109.) [63.17.]
- A Note on Mole Draining. *C. Davies*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), p. 110.) [63.14.]

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- Soil Profiles Developed in Central Somerset. *J. Low*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 239–243.) [63.111 (42).]
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- Some Minerals of the Lower Greensand Beds of the Ashford District, Kent. *E. R. Bransby*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 111–117.) [55 ; 63.113.]
- Some Minerals of the Wye Series. *H. H. Glasscock*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 118–122.) [55 ; 63.113.]
- The Soils of the High Weald of Kent. *B. S. Furneaux*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 123–140.) [63.111 (42).]
- Soil Profile in Relation to Pasture Performance in Romney Marsh. *L. W. Cole* and *J. K. Dubey*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 141–165.) [63.112 ; 63.111 ; 63.33.]

- The Place of English Soils in the International Classification. *S. G. Brade-Birks*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 166-169.) [63.111.]
- Studies on the Carbon and Nitrogen Cycles in the Soil: VII. The Nature of the Organic Nitrogen Compounds of the Soil: "Humic" Nitrogen. *R. P. Hobson and H. J. Page*. (Jour. Agric. Sci., xxii, 3 (July, 1932), pp. 497-515.) [63.113.]
- Studies on the Carbon and Nitrogen Cycles in the Soil: VIII. The Nature of the Organic Nitrogen Compounds of the Soil: "Non-Humic" Nitrogen. *R. P. Hobson and H. J. Page*. (Jour. Agric. Sci., xxii, 3 (July, 1932), pp. 516-526.) [63.113.]
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- The Representation of Soil Analyses by the Device of Double Plotting. *W. Heber Green*. (Jour. Agric. Sci., xxii, 3 (July, 1932), pp. 548-550.) [63.113.]
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- Experiments in England, Wales and Australia on the Effect of Length of Day on Various Cultivated Varieties of Wheat. *H. C. Forster, M. A. H. Tucker, A. J. Vasey and S. M. Wadham*. (Ann. App. Biol., xix, 3 (Aug., 1932), pp. 378-412, pl. xxii and xxiii.) [551.5; 63.311.]
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- Cytological Studies of Some Wheat and Aegilop Hybrids. *J. Percival*. (Ann. Bot., XLVI, CLXXXIII (July, 1932), pp. 479-501.) [575; 63.311.]
- Les effets du froid sur quelques variétés de froment à haut rendement au cours de l'hiver 1931-1932. *E. Larose et R. Vanderwalle*. (Bull. de l'Inst. Agron. et des Stat. de Recherches de Gembloux, I, 3 (Août, 1932), pp. 204-219.) [551.5; 63.311.]
- The Distribution of Some Reserve Substances in Hard Winter Wheat Plant at Successive Growth Stages and their Possible Utilisation. *R. C. Malhotra*. (Jour. Agric. Sci., xxii, 3 (July, 1932), pp. 485-496.) [543.1; 58.11; 58.16; 63.311.]
- Oat Breeding: Notes on Two New Varieties of Oats recently registered by the Department of Agriculture for Scotland. *W. Robb*. (Scottish Jour. Agric., xv, 3 (July, 1932), pp. 273-279.) [63.1952; 63.314.]
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- Manurial Experiments with Hops in Pot Culture. *F. H. Beard*. (Jour. Pom. and Hort. Sci., x, 2 (June, 1932), pp. 91-105.) [63.3451.]

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- High-Protein Pasture. The Rotational or Close-Grazing System of Pasture Management. *F. T. Shutt, S. N. Hamilton and H. H. Selwyn*. (Jour. Agric. Sci., xxii, 3 (July, 1932), pp. 647-656.) [63.33 ; 63.60433.]
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- Effect of a Nitrogenous Manure on White Clover and a Comparison of the Productiveness of Four Types of White Clover under Simulated Pasture Conditions. *R. D. Williams*. (Welsh Jour. Agric., viii (1932), pp. 163-170.) [63.33 ; 63.33-16.]
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- Apple Rootstocks : I to XVI. A Review Summary of the Publications of East Malling Research Station. *R. T. Pearl*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 194-214.) [63.41-195 ; 63.41.]

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DECEMBER, 1932.

NOTES FOR THE MONTH

A DEPUTATION, representing a number of organizations concerned with agriculture in Great Britain and Northern Ireland, was received by the Minister, Major Walter Elliot, and the Secretary of State for Scotland, Sir Godfrey Collins, on November 10. The deputation was introduced by Mr. J. Beard, President of the Central and Associated Chambers of Agriculture, and other organizations represented were the Auctioneers' and Estate Agents' Institute, the Central Landowners' Association, the Chartered Surveyors' Institute, the County Councils' Association, the Highland and Agricultural Society, the Scottish Land and Property Association, the Incorporated Society of Auctioneers and Landed Property Agents, the Land Agents' Society, the Land Union, the Rural Reconstruction Association, the Scottish Chamber of Agriculture, the Scottish National Farmers' Union and the Ulster Farmers' Union. Messrs. A. H. Mason, Alexander Batchelor, W. Jackson, J. O. Steed and Vincent C. Vickers spoke on behalf of the deputation.

The deputation expressed its appreciation of the immediate steps taken by the Government to deal with the situation in the live stock industry and urged upon the Minister the need for giving his early attention to other aspects of the problem of agriculture.

The Minister, in reply, emphasized that the problem of agriculture was essentially one of prices. He felt he could say that the recent catastrophic fall in wholesale prices of meat had been arrested by the drastic methods adopted by the Government for dealing with the situation. Negotiations with regard to the limitation of bacon imports were continuing and would, he hoped, soon reach a satisfactory conclusion. He welcomed the assistance which such bodies as those represented by the deputation could give him in the consideration of the many problems of organization which faced the industry.

Colonel Amery, M.P., and Mr. P. J. Hannon, M.P., thanked the Minister for receiving the deputation.

* * * * *

THE following notice was issued to the Press by the Wheat Commission on November 16 :—

**First Payment
to Registered
Growers under
the Wheat Act**

In his broadcast on October 26, Lord Peel, the Chairman of the Wheat Commission, said that the Commission would make an advance to registered growers on account of the deficiency payment due to them under the Wheat Act.* The Commission have decided to make the advance not later than December 31, 1932.

In accordance with Bylaw 31 of the Wheat Bylaws, 1932, the Wheat Commission now give notice that in order to qualify for the first advance, a registered grower who has sold wheat must deliver his wheat certificate to the Wheat Commission, with the claim and application on the back of the certificate duly signed, *not later than November 30 next*.

Only those farmers who deliver wheat certificates to the Commission not later than November 30 will, if the certificates are in order, be eligible for the advance. *No exception to this rule will be made.*

The Commission urge agricultural merchants and flour millers to do their best to see that wheat certificates are posted promptly to the Wheat Commission.

Farmers who have been unable to deliver their certificates by November 30 must not assume that they will have to wait for payment until August, 1933. On the contrary, the Commission hope, without pledging themselves definitely at the present time, to make a similar advance on account in the early part of 1933, for the certificates delivered since November 30.

* * * * *

THE Eleventh General Assembly of the International Institute of Agriculture opened on October 17, 1932. The

**International
Institute of
Agriculture :
General Assembly,
October, 1932**

opening ceremony was brief and consisted of formal speeches by His Excellency M. de Michelis (Chief Delegate of Italy and President of the Permanent Committee), Signor Acerbo (the Italian Minister of Agriculture), and Sir A. Daniel Hall, K.C.B., LL.D., F.R.S. (the head of the United Kingdom Delegation). The other delegates from

* The Wheat Commission decided, on November 25, 1932, that the amount of this advance should be 3s. per cwt., equal to 13s. 6d. per quarter of 504 lb. See also page 850 of this issue.

Great Britain and Northern Ireland were Mr. H. L. French, C.B. (representative of the United Kingdom on the Permanent Committee), Mr. J. M. Ramsay (of the Department of Agriculture for Scotland), and Mr. D. A. E. Harkness (of the Ministry of Agriculture for Northern Ireland).

The General Assembly unanimously appointed Sir Bhupendra Nath Mitra, K.C.S.I., K.C.I.E., C.B.E. (High Commissioner for India in London), as its President, and His Excellency M. Van Divoet (Belgian Minister of Agriculture) and Dr. Van Rijn (chief delegate of Holland) as Vice-Presidents.

League of Nations.—The first decision taken by the General Assembly was to approve the arrangements that have recently been completed between M. de Michelis, President of the Permanent Committee, and the Council of the League of Nations. The most important features of these arrangements are that the Council considers that the International Institute of Agriculture "is the international institution best qualified to act as the League's advisory organ in agricultural matters and that it is, consequently, a matter of importance to the League to obtain the collaboration of the Institute whenever it is called upon to deal with international questions directly or indirectly affecting agriculture. . . . In all matters affecting agriculture, the International Institute of Agriculture shall have the right at any time to submit to the Council or technical organizations of the League proposals with a view to the examination of special questions. . . . Should the International Institute of Agriculture be entrusted with investigations or other work, any contribution towards the cost shall be settled by mutual agreement within the limits of the budgetary credits provided for this purpose."

Official Recognition of International Organizations and Conferences relating to Agriculture.—The British Delegation had asked for this subject to be placed on the Agenda Paper for the General Assembly in continuation of the consideration given to the matter on the initiative of the same Delegation at the General Assembly in 1924. The discussion attracted much attention and interest. It will, however, be sufficient here to refer to the terms of the resolution on the subject eventually passed unanimously by the General Assembly. The principal features of this resolution were that the General Assembly recommends the Permanent Committee:—

"(2) in particular, to place itself, in respect of this matter, in touch with all the Member States, asking for their assurance that they will ascertain the view of the International Institute of Agriculture before granting official recognition or financial aid to

Organizations or Conferences functioning on the international plane; . . ."

"(4) to establish for this purpose and to keep up-to-date a detailed tabular statement on the objects, functions and activities of all the international organizations dealing with agriculture, or with subsidiary branches of agriculture, or with the preparation of agricultural congresses, and with the help of the Agricultural Economic Committee, and, if need be, also with the help of the International Commission for Co-ordination in Agriculture, to prepare a general scheme of co-ordinated action."

World Agricultural Census.—Attention had been directed by the proceedings of the Institute's Economic Committee to the delay that was likely to occur in the publication by the Institute of the results of the world agricultural census owing to shortage of funds. This matter received careful attention by the General Assembly, with the result that the Permanent Committee were desired to give every priority, over all other work of the Institute, to the world agricultural census in the event of any additional funds becoming available in the near future for the expenditure of the Institute.

Financial Position of the Institute.—The General Assembly had before it a detailed report by Dr. Van Rijn, the representative of the Dutch Government on the Permanent Committee, in which the financial situation of the Institute was fully and frankly disclosed. This report showed that, owing to the fact that many adhering States had failed during recent years in increasing numbers to pay their contributions to the Institute, the small reserve fund which had been accumulated up to 1924 had now entirely disappeared. The important issues arising out of Dr. Van Rijn's report received detailed consideration by the General Assembly, which eventually adopted resolutions making financial provision for the years 1933 and 1934.

Closely allied with the discussion on the financial position of the Institute is the question of the obligations of adhering States to pay their subscriptions regularly to the Institute. This difficult subject also received close attention by the General Assembly, and a unanimous decision was reached as to the steps to be taken in the matter.

ON the advice of the Forestry Consultative Committees the Forestry Commissioners desire to bring the following facts to the notice of woodland owners in Great Britain.

Sales of Woodlands

Instances have occurred in which woodland owners have sold their timber and, not being in a position to replant, have subsequently offered

the land to the Forestry Commission. In other cases the land and timber have been sold to a third party, and the land cleared of timber has been offered. As a rule such land is left in a devastated condition, and after the lapse of a few years has become so overgrown with weeds that the cost of preparation and planting is greatly increased; this naturally detracts from the price which the Commission can pay for the land.

It is suggested that where landowners contemplate extensive fellings or even relatively small fellings, in the vicinity of State forests, and subsequent sale of the land, they might communicate with the Commission before putting the work in hand. It might then be possible to make arrangements that would provide for orderly exploitation of the timber and replanting, thus avoiding the unnecessary expenses referred to above, the dissipation of the valuable forest conditions that takes place when woodland areas are bared for a number of years, and finally, to some extent, the destruction of rural amenities, which has become so common in recent years.

* * * * *

SEED-TESTING is now recognized in most countries as a matter of much importance. Since the inception of seed-testing stations by Nobbe in Germany in

Seed-testing 1869 and Möller Hols in Denmark in 1871, the Germans have given devoted

attention to the growing knowledge of the subject, and have steadily provided full information through the printed word. We, in Great Britain, are, of course, mere tyros in seed-testing as compared with the Danes, Germans, Swiss and other Continental nationals, although we have had an English seed-testing station since 1917. Seven years after he began seed-testing in Tharandt, Nobbe published an excellent guide for other stations that were being started one after another, his *Handbuch der Samenkunde* (1876) being the standard work for many years. In 1885, Harz published an even fuller account of the subject in his *Samenkunde*; and, in 1922, Wittmack's *Landwirtschaftliche Samenkunde* brought the subject up to date. Various other volumes have been published since, the latest substantial work in German, apparently, being that published by Pieper in 1930, entitled *Das Saatgut*.

These few facts will indicate that the subject of seed-testing is regarded on the Continent as deserving of the very closest attention of farmers. It is widely recognized that it is

not a little foolish to sow seeds that are not of the right kind, that are not certain to grow under suitable conditions, or that contain numerous weed seeds to add to the large quantities already present in the soil. Apart from the loss that may be due to trouble of that kind, however, farmers are like other people in not wishing to pay for what they do not receive. If a sample of seeds contains only 85 per cent. of the seed desired, and of these only 80 per cent. will grow under the most favourable conditions, then the purchaser only receives 68 lb. of pure germinable seeds for every 100 lb. he buys. If, on the other hand, the seeds are 95 per cent. pure and of the pure seed 95 per cent. will grow, the purchaser receives 90.25 lb. of germinable seed for every 100 lb. purchased. If the first sample costs 100s. and the second sample 110s., it is a simple calculation to show that it is far better policy to buy the second sample, the comparative "loss" being $100s. - 68s. = 32s.$ on the first sample and $110s. - 90.25s. = 19s. 9d.$ on the second sample, the latter, also, not being likely to convey to the land so large an amount of weed seeds.

It may be recalled that an account of the administration of the Seeds Act, 1920, for the year 1930-31 was given in this JOURNAL for March this year (1932), page 1222.

Particulars of the provisions of the Seeds Act, 1920, and of the charges for testing samples of seed at the Official Seed-Testing Station, Cambridge, may be obtained on application to the Ministry, 10 Whitehall Place, London, S.W. 1.

* * * * *

It is not generally realized, that despite the competition of extensive plant and elaborate machinery concentrated in urban areas, many rural industries survive and give employment to a considerable number of skilled workmen in many parts of the country. There is an average of about 200 smiths, 75 wheelwrights and 50 saddlers to a county. Scattered throughout the land are some 4,000 basket-makers, besides numbers of thatchers and rush-plaiters, potters and bowl-turners, broom-, rake- and hurdle-makers.

Eleven years ago, with the aid of a grant from the Development Commission, a Rural Industries Bureau was established for the purpose of stimulating these industries, and retaining in the countryside those engaged on them, thus arresting migration to the towns. In order to assist single-handed craftsmen and small employers in the various trades, the Bureau employs demonstrators who offer gratuitous advice on practical problems. Another branch

of its work is the organization of exhibitions, at which no charge is made for space, thus leaving the Bureau free to reject productions of poor quality.

By the courtesy of the District Railway Company, the Bureau was able to stage an exhibition, from November 7 to 17 last, in the booking-hall of the Underground Station, Charing Cross, where baskets of various types, country-made tools, hand-dressed oak-tanned leather, and specimens of wood-turnery, pottery, ironwork, furniture, silver and textiles were displayed. Another exhibition of a somewhat different character was held from November 10 to 16, under the auspices of the National Federation of Women's Institutes, at the Horticultural Hall, Vincent Square, Westminster. The opening ceremony was performed by Her Majesty the Queen. The exhibits included embroidery, quilts, rugs, furniture, upholstery, furs, gloves, toys, baskets of willow, cane, rush and raffia, as well as examples of smocking, spinning, knitting, weaving and carpentry. Practically all the work was done at home in spare time, and most of the counties of England and Wales were represented in the exhibits.

* * * * *

THE Agricultural Machinery Testing Committee was appointed by the Minister of Agriculture and Fisheries in June, 1925, to supervise the arrangement and conduct of all tests of agricultural, including dairying, machinery and appliances carried out on behalf of the Ministry, and to prepare the certificates and reports embodying the results of these tests for issue by the Department. The object of the tests is to furnish accurate information as to the utility, efficiency, reliability and working costs of each machine or implement tested and to provide data which may assist towards the improvement of agricultural machinery.*

The Committee has now presented its second report, which deals with the work carried out under its direction during the two years ending March 31, 1932.

The origin, development and scope of the agricultural machinery testing scheme was dealt with in the Committee's

* An explanatory pamphlet relating to the scheme of testing, embodying the regulations and the schedule of fees for testing all classes of agricultural machinery and appliances, together with forms of entry for the tests, may be obtained free and post free on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

first report.* The present report shows that during the two years under review 16 individual tests were put in hand, and 8 of these were completed within that period. At March 31, 1932, 30 of the combined certificates and reports issued to entrants had been published. The first 20 of these appeared as Appendix IV to the Committee's first report, and the remainder have been published separately from time to time as soon as they became available. A list of these separate publications is given below.

The Committee reports that all the dairy machinery and appliances accepted for testing have been tested at the National Institute for Research in Dairying, Reading University, with the assistance of the Institute of Agricultural Engineering for any engineering or purely mechanical testing work required; while the other agricultural machinery has been tested at the Institute of Agricultural Engineering, with the assistance of the National Physical Laboratory for such work as the belt test of tractors and the calibration of certain instruments used for testing purposes. The Institute of Agricultural Engineering has recently acquired the necessary apparatus and instruments for carrying out the whole of the testing of tractors, and following this, the cost of such tests has been reduced. This has led the Committee to recommend that the fees charged for the belt and traction tests of tractors be limited to maxima of £20 and £30 respectively, making a maximum fee of £50 for a complete tractor test. This recommendation has been accepted and the revised fees will apply to all future tractor tests.

The Committee emphasizes that the testing of agricultural machinery in this country is still in its infancy, and that as experience is gained, so the reports on tests can be cast in a form of greater utility both to the manufacturer and to the farmer. The ideal at which the Committee is aiming is to produce a standard form of test for each of the somewhat widely divergent types of machinery used in agriculture, since such a standard would enable a much truer comparison to be made than is at present possible between machines coming within the same category. Considerable progress in this direction is recorded in respect of two classes of machines, namely, tractors and milk-cooling plants. As regards tractors, it has been decided to adopt for the time being a form of test based mainly upon the standard used in the Nebraska Tractor Trials, with modification as regards the inclusion of specific references to oil dilution. Highly diluted

* Published by H.M.S.O., 1931, price 3s. 6d. net.

oil is, next to dust, the greatest factor concerned with excessive wear of the engine, and the Committee, therefore, consider it necessary to embody measurements of this kind in all future reports on tractors.

In its conclusions, the Committee records its opinion that the Agricultural Machinery Testing Scheme continues to serve a most useful purpose, and will increase in value as more experience is gained of its working. Further, it supplies a definite want in providing, both for the manufacturer and the prospective purchaser, an unbiased statement of the actual performance of a machine in a test carried out over an adequate period, and under carefully controlled conditions. The Committee adds that such tests not infrequently lead to the discovery of problems on which research can and should be undertaken.

CERTIFICATES AND REPORTS SEPARATELY PUBLISHED UP TO
MARCH 31, 1932.

(Copies are obtainable from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, at the prices mentioned in column 1.)

Certificates and reports	Entrant	Implement	Date of certificate
No. 25 (Price 2 <i>d.</i> net)	Messrs. A. C. Bamlett & Co., Ltd., Thirsk, Yorkshire	Mowing Machine	Nov. 12, 1930
No. 26 (Price 3 <i>d.</i> net)	Messrs. J. & E. Hall, Ltd., Dartford Ironworks, Dartford, Kent	Milk Cooling Plant	May 18, 1931
No. 27*	Messrs. Vickers (Crayford), Ltd., Crayford, Kent	Agricultural Tractor	Nov. 22, 1930
No. 28 (Price 2 <i>d.</i> net)	Messrs. The Ford Motor Co., Ltd., Trafford Park, Manchester	Agricultural Tractor	July 28, 1931
No. 29 (Price 2 <i>d.</i> net)	Sir Herbert Austin, K.B.E., Longbridge Works, Northfield, Birmingham	Agricultural Tractor	July 2, 1931
No. 32 (Price 2 <i>d.</i> net)	Messrs. Johnson & Johnson (Great Britain), Ltd., Slough, Bucks	"Zobee" Milk Filter Discs	Aug. 18, 1931
No. 33 (Price 2 <i>d.</i> net)	Messrs. Johnson & Johnson (Great Britain), Ltd., Slough, Bucks	"Rapidflo" Milk Filter Discs	Aug. 17, 1931
No. 34 (Price 2 <i>d.</i> net)	Messrs. Packs (1925) Ltd., Feltham, Middlesex	Paper Milk Container	Aug. 19, 1931
No. 35 (Price 2 <i>d.</i> net)	Messrs. The Pulsometer Engineering Co., Ltd., Reading	Milk Cooling Plant	Sept. 19, 1931
No. 36 Price 2 <i>d.</i> net)	Messrs. Harrison, McGregor & Co., Ltd., Leigh, Lancs	Mowing Machine	Dec. 15, 1931

* This publication has been withdrawn.

FOR success with the modern methods of rearing chickens, it is essential that the poultry keeper should possess not only a sound knowledge of the principles underlying these methods but the skill necessary to practise them.

**The Rearing
of Chickens**

A Bulletin* has recently been issued by the Ministry, which is designed to assist both the beginner in the industry and those who have some experience. The author is the late Director of the National Institute of Poultry Husbandry, Mr. R. T. Parkhurst, B.Sc., M.Sc. The Bulletin describes the selection of birds for the breeding pen, selection of eggs for hatching, importance of sanitation; natural and artificial brooding; brooding equipment and operation (out-door and colony brooders, the coal stove hover, blue-flame lamp or paraffin-burning and electric hovers, multiple unit and hot-water systems); preparation of the brooder, starting the chicks, and battery brooders; starting rations, hoppers and hopper space, mixtures recommended, and ingredients of the rations. The later management in colony brooders (weaning, treatment of pullets and breeding cockerels on range, summer range shelters, and disposal of surplus cockerels) is included, while a brief reference is made to diseases.

* * * * *

THE volume of *Reports on the Work of Agricultural Research Institutes in the United Kingdom, 1930-31*, which has just been issued by the Ministry,† summarizes in a convenient form the progress of agricultural research carried out with the aid of State funds during the academic year October 1, 1930, to September 30, 1931. The present volume is planned on the same lines as its predecessor, which covered the academic year 1929-1930.

**Reports of
Agricultural
Research**

Institutes, 1930-31

An addition has, however, been made by the insertion at the end of each report of a numbered list of the papers published during the year by each institute or research centre. References to these papers will be found in the text. These lists take the place of the annual volumes of *Abstracts*

* Bulletin No. 54, *The Rearing of Chickens*, obtainable through any bookseller or from H.M. Stationery Office, price 6d. (8d. post free).

† The volume is not priced, but a limited number of copies is available for free distribution to applicants, who should address their request for copies to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

of *Papers on Agricultural Research in the United Kingdom*, publication of which has been discontinued.

The first and by far the largest section of the Reports is devoted to summaries of the research work carried out at Agricultural Research Institutes and at certain State institutions, such as the Ministry's Plant Pathological and Veterinary Laboratories. (As regards Northern Ireland, agricultural research is conducted entirely by its Ministry of Agriculture.) The section is sub-divided according to the subjects dealt with, beginning with "Soils, Plant Nutrition and Plant Physiology" and ending with "Agricultural Engineering."

Then follows a section in which are described the local investigations carried out at Advisory Centres by the Advisory Officers maintained by the Ministry and the Department of Agriculture for Scotland. These reports are also grouped by subjects, viz., chemistry, entomology, mycology and botany, veterinary science, agricultural and dairy bacteriology, economics, and grass land.

The third and last section is composed of reports on a number of miscellaneous investigations of a comparatively minor character, falling outside the scope of the main work of Research Institutes. An appendix contains a list of Directors of Research Institutes and Heads of Advisory and other Centres, and a revised form of subject index has been added.

Although the volume is primarily designed to help the scientific worker to keep in touch with investigations at other centres, it will also give the lay reader some idea of the variety of the research work that is being done each year for the benefit of agriculture. A glance at the table of contents will show that a very comprehensive organization has been built up, and that no branch of agricultural science is neglected. A few random examples of lines of research described in the reports will suffice to indicate the wide range covered. The Rothamsted Experimental Station is studying the problem of the maintenance of soil fertility in regions where mechanization is advancing and live stock is being reduced. The Institute of Animal Pathology, Cambridge University, is continuing its vaccination of calves with B.C.G. in an attempt to render them immune to tuberculosis. The Fruit and Vegetable Preservation Research Station, Bristol University, is investigating scientific problems directly connected with the improvement of the quality of English canned products.

The National Institute for Research in Dairying, Reading, is collecting information on the inheritance of milk and butter-fat yielding capacity. These examples are given, not because of their outstanding importance, but merely, as stated above, to illustrate the wide range of subjects covered in the reports.

* * * * *

IN pea-growing areas it is not uncommon, if conditions seem favourable, to sow seed during the winter months in the hope of securing a crop for the first markets. These early sowings, which may take place at any time between the beginning of November and the end of February, are bound to be of a speculative character, since their success depends so much upon outside factors. Unless the situation, the soil conditions, and the weather all favour the grower, there is a serious danger of a poor plant or even of complete failure.

Early Pea Sowings

Sellers of seed peas are required to give buyers a written statement as to the purity and germination of the seed. Though some sellers quote actual percentages, the statutory document often takes the form of a statement that the purity and germination are "above the authorized minimum," which means, in the case of garden peas, that the purity is not less than 97 per cent. and the germination not less than 70 per cent.

This is, no doubt, sufficient for ordinary purposes, but where seed is to take the chances of winter sowing, it is preferable to go a step further. There is no method of seed-testing that will ensure a crop under unsatisfactory cultural conditions, but the risk of failure will be reduced if the seed sown is of high germinative "energy"; and the best way of judging germinative "energy" is by reference to the percentage of germination in five or six days. Growers will be well advised, therefore, if for early sowings they secure seed that shows high germination on a six-day test.

It is the invariable practice of the Official Seed Testing Station to give germination results for peas after six days in test as well as at the completion of the full period. Any farmer proposing to sow peas can have a test made (for his own information) at the low fee of 6d. per sample. The sample should be of at least 4 oz. in weight and should be addressed to the Chief Officer, Official Seed Testing Station, Huntingdon Road, Cambridge, together with a postal order for 6d. and a letter stating that the test is wanted for his own information and not for the purpose of making a declaration on sale.

EXTENSION WORK ON THE CONTROL OF WARBLE FLIES

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and

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As the economic status of warble flies has received much attention during recent years, it is unnecessary to recapitulate their life-history or to dwell upon the extensive annual losses caused by them. Stockbreeders and leathersellers are agreed that every effort should be made to combat this important stock pest. The most desirable method of control would be to prevent the warble flies laying their eggs on the cattle, but, unfortunately, the physiology of the flies is such that control on these lines has not been found possible; the flies are not even repelled by the most noxious chemicals. Moreover, if such a treatment were applicable, it is doubtful if more would be achieved than the driving of the fly to untreated cattle. The destruction of the eggs after they have been laid, mainly on the legs of cattle, also presents insurmountable practical difficulties. For these reasons, the problem has been approached from a more promising angle. During early spring, no warble flies are at large; they are confined in larval or grub stage within the animals—hence to destroy all the larvae as they present themselves on the backs of the cattle should, theoretically, bring about the eradication of the flies. The extension work, the results of which are now published, was undertaken to ascertain if the treatment of warbled cattle over a large area was practicable, and to discover the degree of control that could be achieved under ordinary farm conditions.

Treatment.—The work of Bishopp¹* in America has been followed up in this country by several workers^{2, 3, 4, 5}, and has shown that a wash prepared from Derris powder is the best yet discovered for the destruction of warble fly larvae on the backs of cattle. The formula generally used is that of Bishopp: 1 lb. Derris powder, $\frac{1}{4}$ lb. soft soap, 1 gallon of water. (Particulars of preparation and application can now be had from Agricultural Colleges or County Agricultural Officers.†)

* References are given at the end of the article (p. 813).

† Advisory Leaflet No. 45, *The Warble Fly*, may be obtained free and post free by stock owners on application to The Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1.

Demonstration Areas.—Large demonstration areas were selected in North Wales during 1930, within which all infested cattle were treated with Derris powder wash at monthly intervals from mid-March until June. Trials were first carried out in S. Caernarvonshire and, as it was possible to make more critical counts in these areas, the results, which are representative, will be confined to this district. The extension work was made possible by a grant received from the Leathersellers' Company, augmented *pro rata* by a contribution from the County Agricultural Committee.

Demonstration Area 1.—The natural starting point in North Wales for the campaign, which had in view the eradication of the warble flies, was the Lleyen Peninsula, S. Caernarvon. In 1930, all farmers from the extreme point of the peninsula to about two miles inland were supplied with Derris powder with which they dressed their infested cattle. The degree of infestation of cattle with warbles before treatment is shown in Table I. An examination, made early in March, 1930, showed

TABLE I.—INFESTATION OF WARBLER ON CATTLE IN DEMONSTRATIONAL AREAS BEFORE AND AFTER TREATMENT

Area	Year	Holdings visited (sample)	Percentage of holdings infested	Total cattle examined	Percentage cattle infested	Total number of warbles	Average number of warbles per animal
1 (Aberdaron)	1930	36	100	235	91.9	3,332	14.2
	1931	36	86.1	191	52.4	529	2.2
	1932	36	30.6	233	22.8	173	0.77
	1932*	4	100	72	95.0	819	11.3
1 (Extended)	1931	7	100	107	91.5	1,713	16.01
	1932	12	25	209	16.2	112	0.53
	1932*	4	100	72	95.0	819	11.3
2 (Nant Penn)	1931	33	93.9	94	79.3	1,108	11.7
	1932	33	27.2	80	15.0	58	0.72
	1932*	7	100	75	90.7	912	12.1
3 (Nebo)	1931	16	100	43	91.0	617	14.3
	1932	16	24	49	24.4	27	0.5
	1932*	4	100	68	89.5	854	12.6
4 (Rhoscolyn)	1931	53	100	412	97.5	6,386	15.5
	1932	23	30	229	15.4	257	1.1

* Counts on *untreated* cattle near border of treated area.

that 91.9 per cent. of the cattle were infested and that the average number of warbles per animal (including uninfested cattle) was 14.2. The results of one year's treatment of cattle was shown by counts made at the same period during 1931 when the cattle on the same farms gave an average of 2.2 warbles per animal and only half the cattle were infested. The season had not accounted for these results—in fact, 1930 was particularly favourable for the fly, as was shown when 107 cattle were examined about one mile from the treated area. These *untreated* cattle gave an average of 16.01 warbles per animal and 91.5 per cent. of the cattle were infested. During 1931, the farmers again dressed their infested cattle and the results of the second year's treatment were obtained during March, 1932. It was then found that the average number of warbles per animal had been reduced to 0.77, while only 22.8 per cent. of the cattle were infested and the cattle on 75 per cent. of the holdings were free from warbles. The presence of warbled cattle on certain of the holdings will be discussed later. Again, seasonal factors had not accounted for this reduction, for *untreated* cattle within a mile from the demonstrational area yielded 11.5 warbles per animal and 90 per cent. of the cattle were infested.

Area 1 was extended to about eight miles from the point of the peninsula, thus including 1,400 more cattle. In this area a man was employed to treat the cattle. A sample of untreated cattle was examined in 1931 when, as stated, there was an average of 16.01 warbles per animal. In 1932, a sample 209 cattle on 12 holdings yielded 0.53 warbles per animal, 16.2 per cent. of the cattle being infested.

Demonstration Area 2.—It was of considerable interest to ascertain whether an inland valley could be cleared of its warble flies without fear of re-infestation from farms the other side of the mountains or hills. For this purpose, the Llanberis Pass was selected, and all the cattle, from the summit—Penygwryd—down to Llanberis, were examined and treated in 1931. The infestation before treatment (see Table I) was heavy, for 79.3 per cent. of the cattle were infested and there was an average of 11.7 warbles per animal. Derris powder was supplied to the owners, who dressed their cattle according to instruction. An examination at the same period in 1932 showed that only 15 per cent. of the cattle were infested and the average number of warbles per animal had been reduced to 0.72. This result was striking in view of the fact that nine *untreated* cattle on a farm in Llanberis, only half a mile from

the border of the treated area, were all infested and averaged 17.5 warbles per animal. Further, 75 *untreated* cattle on farms a little lower down the valley averaged 12.1 warbles per animal.

Demonstration Area 3.—Another type of district in North Wales is the upland plateau. To ascertain the degree of success that could be obtained in such districts a demonstration area was established at Nebo, near Caernarvon. This plateau is 760 feet above sea level and has the mountains behind to the S.W. and all other sides fall rapidly to lower districts. In 1931, a sample of the cattle to be treated showed that 91.0 per cent. were infested and the average number of warbles was 14.3 per animal. Here again the farmers carried out the four monthly treatments of their infested cattle. The success attained in this district was shown on examination in 1932, when only 24 per cent. of the same cattle were infested and the average number of warbles per animal was 0.5. Again, the general infestation of untreated cattle just outside the demonstration area was heavy, 89.5 per cent. of the cattle being infested and the average number of warbles per animal was 12.6.

Demonstration Area 4.—The lowland district remained to be investigated, and one of the writers, in conjunction with the Director of Agriculture for Anglesey, arranged a demonstration centre at Rhoscolyn, near Holyhead. This district, which covers over 1,500 acres, is flanked on the south-west border by the Irish Sea. The infestation here before treatment was heavy, for 97.5 per cent. of the cattle were warbled and the average number of warbles was 15.5 per animal; one 2-year-old heifer had 101 warbles! A sample of the cattle showed that, in 1932, this infestation had been reduced by the treatment to 20 per cent. infested and the average number on the 108 cattle examined was only 1.1 per animal. No opportunity occurred to examine cattle in untreated districts near this area, but, from handling cattle in the marts in Anglesey, it was apparent that the infestation of cattle with warbles was very heavy in this county during 1932.

Discussion of the Results.—It is evident from the tables that, in all types of districts where demonstrations were conducted, a considerable reduction in the warble fly population has been obtained by large-scale treatment of warbled cattle with Derris powder wash. In fact, on many holdings the cattle were entirely free from warbles after two years' and, in some cases, after one year's treatment. The outstanding factor influencing this reduction appears to be

the very local habit of the fly. This was strikingly demonstrated when visiting the farms and viewing the lay-out of the land, particularly on farms near the border of the treated areas. Reference has been made to the evidence of local distribution of the fly obtained in Llanberis Pass, when there was practically no migration of the warble flies from the heavily-populated, untreated area to the treated area up the valley; neither was there evidence of any migration over the mountains. The topographical nature of this district was perhaps exceptional, but similar evidence was common in the lower-lying districts. In Aberdaron district, for instance, three farms in one section, which had only a small hillock separating them from the heavily infested farms in the untreated area, had all the cattle free from warbles. If the fly travelled any appreciable distance it would easily have traversed the hill 100 feet high separating it from the non-infested cattle grazing this shallow vale.

Again, even on flat land with little natural boundary, the flies did not appear to have travelled far, for, in Extended Area 1, 78 cattle just inside the treated area yielded an average of 1.2 warbles per animal whereas 72 cattle in the untreated area averaged 11.3 warbles per animal. One farm in this area had 12 cattle (mixed ages) grazing near the home-stead, and 13 other cattle of similar ages grazing in fields less than one mile away, but near the untreated border. All the former cattle were free from warbles, while all but one of the latter were infested, averaging three warbles per animal. Further evidence of the local habit of the fly was forthcoming in two separate instances where the cattle were unsatisfactorily dressed—live warbles being common 15 days after treatment. These cases are quoted because they stress the importance of thorough treatment. At one farm in Area 1, in 1932 (after treatment), 50 per cent. of the cattle were infested with an average number of 2.2 warbles per animal. Some of the fields on this farm were let for grazing and it was remarkable how, when infested cattle were found among clean cattle on adjacent farms, inquiry showed that these had been grazing on the unsatisfactory holding. Precisely the same observations were made at one unsatisfactory holding in Area 4, which also had fields let for grazing. It is felt that had it not been for these holdings an even greater reduction in the warble-fly population would have been achieved.

These observations on the very local habit of the fly have an important bearing upon the control of warble flies in

general. It would appear that many farmers, owing to the topographical situation of their farms, can obtain a considerable reduction in the infestation of warbles on their cattle even if they alone are treating their cattle. In other instances, small groups of farmers who occupy the farms in an inland valley or on an upland plateau, or similar area of land, with natural boundaries, can by co-operative effort obtain very appreciable results. In low-lying flat districts, the area to be treated would have to be correspondingly larger if significant results are to be obtained, but, even here, since the warble fly apparently does not travel any considerable distance, the united effort of a few farmers owning large farms would considerably reduce the warble fly population of the district.

Experiments on further Aspects of Treatment.—In areas where an appreciable reduction of the warbles on cattle has been obtained, the preparation of a wash to dress only a few cattle might appear troublesome. Further, the purchasing of a few cattle with warbles, after the herd has been treated, renders it desirable to treat these effectively and as easily as possible. Experiments were, therefore, conducted in 1931 to ascertain what percentage kill could be obtained by using *dry* Derris powder. This was applied by rubbing the powder in by hand after the backs of the cattle had been well brushed with a scrubbing brush. This work was carried out independently by both writers and the results are given in Table II.

TABLE II. —RESULTS OF TREATMENT WITH DRY DERRIS POWDER

Farm	Number of cattle	Number of warbles treated	Number of warbles killed	Percentage killed
A ..	9	58	56	96.5
B ..	20	244	230	94.3
C ..	7	114	109	95.6
Total ..	36	416	395	95.1

It will be observed that a high-percentage kill can be obtained by the use of dry Derris powder, although it was not quite as good as the 100-per-cent. kill obtained on the control cattle when the wash was used. The few live warbles removed were small and suggested that the hole in the skin was too small for the powder to penetrate when the cattle were treated. The time taken to treat with the dry powder

was practically the same as with the wash, while the number of warbles treated was slightly greater in the case of the dry powder, probably owing to the localized treatment. There was a slight irritation of the throat experienced through inhaling the powder, but this was no worse than when preparing the wash. It is not suggested, however, that the dry treatment should replace the wash, because, especially in the case of young untied stock, the wash is more easily applied. It is felt, nevertheless, that frequent occasions arise when it would be an advantage to use the dry powder. Further, the value of the dry powder for the destruction of lice on cattle enhances this method of application, and many farmers now also dress their cattle for lice when treating for warbles.

Experiments on the Toxicity of Cube Root Powder.—Cube Root is another powder obtained from a tropical plant, but it has a much higher rotenone content; rotenone is believed to be the toxic element in Derris powder. Cube Root is not yet available on the market, but a sample was obtained direct from Peru through British Drug Houses, Ltd. The object in testing a further material was not with the idea of improving upon the results obtained with Derris powder wash, but simply to ascertain if the cost of the treatment could be reduced. Cube Root is similar in price to Derris, but, with a higher rotenone content, promised to give equally good results at quarter strength. The trials were conducted as previously⁵ under three groups: (a) critical treatment of individually mapped warbles, (b) special farm conditions when the writers, independently, treated cattle under farm conditions, and (c) when the farmers themselves carried out the treatment. The results have been tabulated in Table III.

The results show that under the critical and the special tests, a high-percentage kill was obtained with the Cube Root wash at $\frac{1}{4}$ lb. Cube Root per gallon. However, it was never possible to get the 100-per-cent. kill that was obtained with Derris powder (1 lb. per gallon). In all cases, just one or two warbles on some of the cattle remained alive, a fact that was difficult to explain, particularly when so many of the warbles had been killed. Under ordinary farm conditions, when the farmer carried out the treatment, the results were variable and in most cases unsatisfactory. In the case of C(1b), it should be mentioned that the untied cattle treated with Derris powder wash also failed to show more than

A DORSET SHEEP AND CORN FARM

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Descriptive.—In a previous issue of this JOURNAL,* the financial results of a Dorset cheese-making farm for the six years, 1924-30, were described. In the present article, a similar description is given of the financial results of a very different type of farm in the same county, for the eight years ending Lady Day, 1932. Both descriptions are based on detailed accounts kept by the Agricultural Economics Department of Reading University, and they are presented as illustrations of the financial fortunes, during a period of acute depression, of individual farms selected as representatives of important farming systems.

This farm is fairly remotely situated, at an elevation ranging from 400 to 600 ft., on one of the southern spurs of the chalk highlands that stretch from Salisbury to Dorchester. It is just over 500 acres in area, of which approximately 20 per cent. is rough downland grazing, 15 per cent. better grass, and the remaining 65 per cent. medium and light arable land on chalk. Having regard to soil, elevation and situation, the holding lends itself to arable-sheep farming, and a flock of pedigree Dorset Horn sheep forms the pivot of the farming system.

The flock consists of 350 breeding ewes with 140 ewe lambs for annual replacements. It is the practice to take three crops of lambs from each ewe, which is then sold as a full-mouthed sheep warranted in tooth and udder. No attempt is made to take a lamb until the sheep is two years old, although there is a growing practice of lambing from hoggs. Neither is there any attempt to take advantage of the propensity of the breed to produce two crops of lambs annually. This applies to the owners of most registered flocks, the practice of twice-yearly lambing being confined to grass farmers who buy regular draft in-lamb ewes from the arable flocks, lamb them down in November or December, run them with a Down ram and secure a second crop of lambs in May.

On this farm, the lambs are turned out in May and the ewes lamb in October and November. Over the eight years, there has been an average crop of approximately 140 lambs per 100 ewes. The ewes lamb on grass and get a little of the very best

* April, 1931.

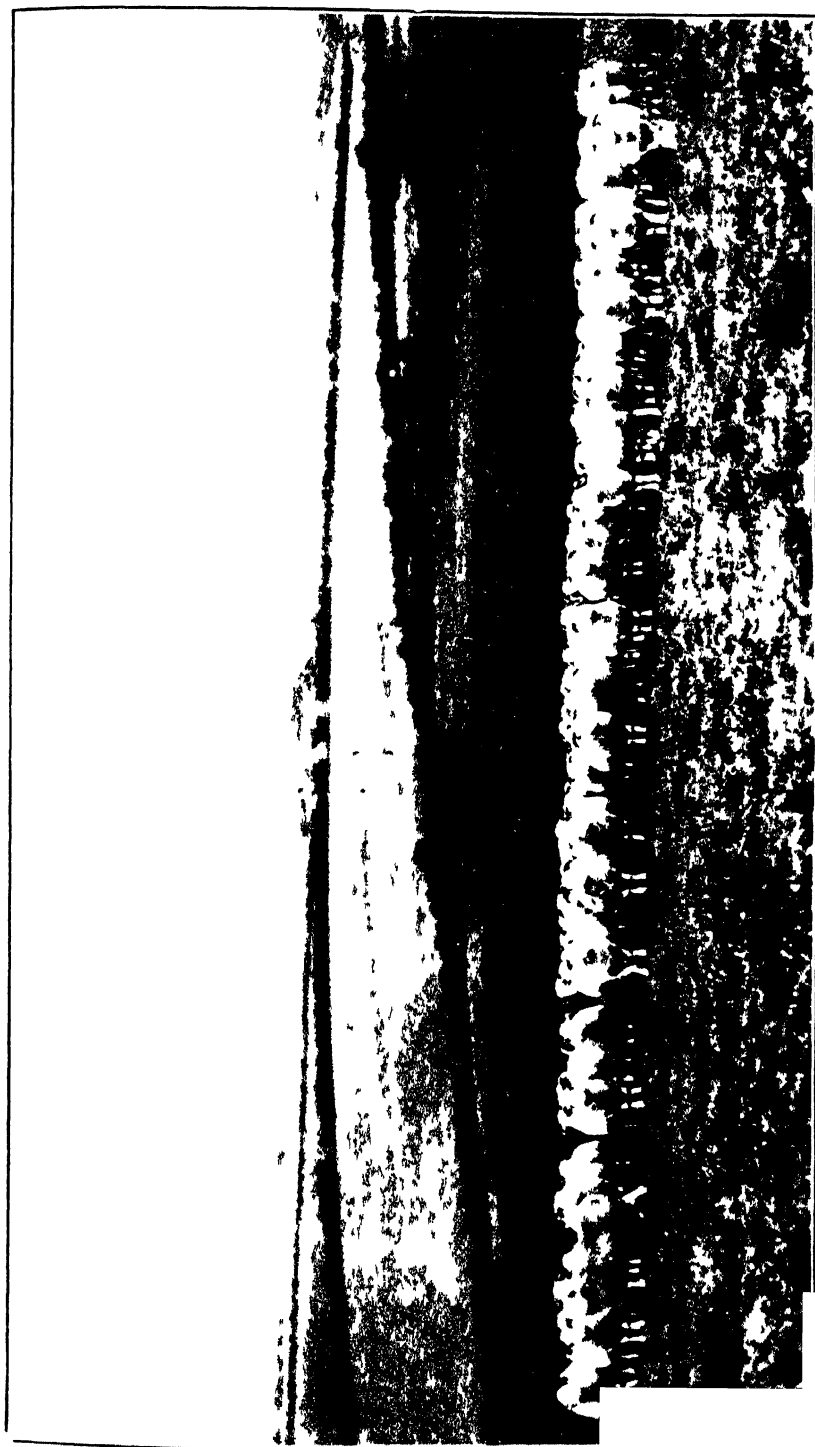




Fig. 4. Der-Horn (left) and Der-Horn (right) sheep.

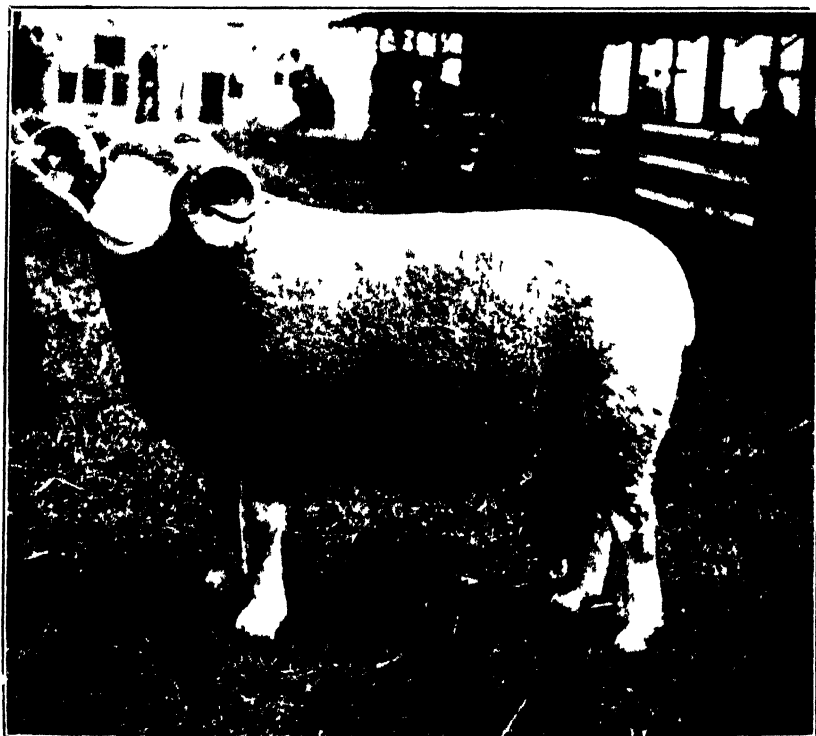


Fig. 5. Der-Horn shearing ram. First prize winner at the Royal Show.

hay before lambing. No elaborate lambing pen is used, but pens of thatched hurdles are available for difficult cases. The ewes and young lambs are first drafted to young clover and later folded on roots. The general method is to draft the single male lambs and twins into the same lot and the single ewe lambs into another, so that the males and twins may receive more careful treatment. The ewes are fed with cake and corn, and the lambs are encouraged to run forward through creeps to nibble at a mixture of linseed cake, peas and oats. Most of the lambs are sold in February and March, at an average dead weight of about 40 lb. per head. Besides the early lamb trade, considerable attention is also given to the trade in ram lambs, surplus ewe lambs and draft ewes.

Although the major emphasis is on the production of early fat lambs for sale, the sheep also fulfil the function of maintaining the fertility of the soil for the production of sale crops. Thus, although during spring and summer they are treated largely as grass sheep, they are also folded at this time for the purpose of clean lying and improving the arable land. No use is made on the farm of the large quantity of straw produced, of which as much as possible is sold, so that the dung cart is not of great importance in the farming system. In addition to the sheep, a few store heifers are reared on surplus grass, and a few store pigs are also produced. In short, the farming is typical Dorset corn and sheep husbandry on medium, low-rented and comparatively inaccessible land.

Use of Land, Capital and Labour.—*Land.*—The use made of the land is illustrated in Table I. where the percentage distribution of the chief crops in the first and in the last year of the period, as well as the average distribution for the eight years, is shown.

TABLE I.—DISTRIBUTION OF LAND

	1924	1932	Average 1924-32	
	Acres	Acres	Acres	Per cent
Cereals.. ..	165.25	126.50	144.30	27.7
Seeds hay	55.25	80.00	77.40	14.8
Roots and catch crops*	110.50	88.00	96.60	18.5
Meadow hay	20.00	63.00	27.60	5.3
Grass and down ..	170.50	164.00	175.60	33.7
	521.50	521.50	521.50	100.0

* Roots were grown on this total area, but catch crops on a part only.

These figures show that there was some decrease during the period in the arable acreage under cereals and under green crops, with a corresponding increase for grass and hay. There

was, however, no major change in the essential character of the cropping during the period, except that some 30 acres were laid down to grass and more importance was attached to catch crops. The usual rotation was roots, corn, seeds (one or more years), corn. Over the eight years the three cereals—wheat, barley and oats—were grown in the ratio of 1 : 1·4 : 1, although, for individual years, there were differences in the relative acreages under each crop arising primarily from the conveniences of the rotation. Of the other arable crops, the most important were swedes and turnips; on the average, some 55 acres of the former and 35 acres of the latter were grown. Only a small area (from 3 to 4 acres) of mangolds was grown. Catch crops were important throughout, rye-grass, trefoil, vetches and various mixtures of these being grown. Taking the eight years together, over 54 per cent. of the crops, both arable and grass, was marketed through the sheep, while less than 23 per cent. was sold off as cereal crops and hay, the remainder being used by the horses, cattle and pigs.

Capital.—The nature of the distribution of the capital invested in the business is shown in Table II, the per acre figures given being the averages of the nine Lady Day valuations taken.

TABLE II.—DISTRIBUTION OF CAPITAL

						Average of nine Lady Day valuations		Per cent.
						Per acre		
						£	s. d.	
Sheep ..	..	..	..	..	..	6	8 8	59·2
Horses ..	..	..	..	..	..	0	11 11	5·5
Other live stock		..	..	..	..	0	9 8	4·4
						<hr/>		<hr/>
Total live stock	..	..	..	..	..	7	10 3	69·1
Implements and machinery ..				..	..	1	13 2	15·3
Stores and home-grown produce				..	..	0	12 8	5·8
Tillages	..	..	..	..	..	1	1 4	9·8
						<hr/>		<hr/>
TOTAL ..	..	..	..	..	..	£10	17 5	100·0

The average total capital invested was approximately £5,700, or £10 17s. 5d. per acre. Capital invested in sheep accounted for 59·2 per cent. of the total, a further 15·3 per cent. representing the value of implements and machinery, and 9·8 per cent. the value of tillages. An interest rate of 5 per cent. on the investment would necessitate an average annual net surplus of at least £285, over and above the remuneration of the farmer as manager, plus any profits from the undertaking.

Labour—Manual, Horse and Tractor.—The farm gave regular employment throughout the period to 10 men and 2 boys. The adjoining hamlet in which these men live is almost entirely dependent on the farm, and this consideration influenced the farmer's attitude in foregoing any change in his farming system, having as its objective a reduction in the number employed. It would be difficult to criticize such a viewpoint, having regard to all the economic and social implications of the environment in which the farmer had to make his decisions. During the eight years, approximately £7,800 was paid in wages, which is equivalent to a labour bill of approximately £20 a week, or just under £2 per acre per annum. The average number of hours worked per acre per annum was 59, and the average cost was just over 7.5d. per hour.

The number of work-horses kept averaged 10. The average number of hours worked per acre per annum was 32, and the horses worked approximately 32 hours per horse-week throughout the period. The average costs were £30 3s. 1d. per horse per year, or 4.35d. per hour worked.

One tractor was in use throughout the period. In 1928, a new tractor was purchased, the original one having reached scrap value in that year, although it was retained for occasional use during the busier periods and for belt work, such as chaff-cutting, cake-cracking and bruising corn. The tractor was used fairly regularly throughout the year, and not only to cope with accumulation of work during the busy seasons. It was in use for approximately 1,000 hours each year, and the average cost of running was roughly 2s. 9d. per hour. Judged by the fairly full utilization of the manual, horse and tractor forces indicated by the above figures, the management of the labour supply appears to have been highly efficient.

General Financial Results.—Possibly the best picture of the financial structure of the farm is provided by the summary of the expenses and receipts for the eight years shown in Table III (p 818).

These figures bring out several important features of the system of farming. In the first place, both the average expenditure and the average receipts were under £6 per acre, modest figures as compared with those obtaining on more intensive systems of farming, whether arable or grass.

On the expenditure side, wages accounted for 35.2 per cent. of the total outgoings for the eight years, feeding stuffs for 22.5 per cent., rent and rates for 13.5 per cent., equipment

TABLE III.—SUMMARY OF EXPENSES AND RECEIPTS, 1924-1932

<i>Expenses :</i>	Average per acre per annum			Per cent.
	£	s.	d.	
Wages	1	17	3	35.2
Feeding stuffs	1	3	9	22.5
Rent and rates	0	14	4	13.5
Equipment and repairs	0	10	10	10.3
Seeds and manures	0	8	5	8.0
Other expenses	0	11	2	10.5
TOTAL EXPENSES	5	5	9	100.0
<i>Receipts :</i>				
Sheep	3	9	0	61.1
Crops	1	14	3	30.3
Other receipts	0	9	8	8.6
TOTAL RECEIPTS	£5	12	11	100.0

and repairs for 10.3 per cent. and seeds and manures for 8.0 per cent. The low figure for equipment and repairs was partly due to the excellent condition of the equipment at the commencement of the period, and partly to the economy exercised by the farmer in the later years, especially in the matter of replacements. The low expenditure on manures reflects the importance of sheep as agents in maintaining the fertility of the soil. During the period, there was an increase in the relative importance of wages, and of rent and rates, while there was a decrease, both actual and relative, in the cost of purchased foods.

The figures for receipts emphasize the paramount importance of sheep, which accounted for 61.1 per cent. of the total eight years' incomings. A further 30.3 per cent. of the receipts was derived from crops, and the remainder was mostly derived from the sale of cattle and pigs.

A summary of the general financial results for each of the eight years, and for the period as a whole, is given in Table IV.

The result of each enterprise is shown in the form of a "surplus" or a "deficit," as no attempt was made in the accounting process to arrive at the specific profit or loss. The reason for this was that in the system of farming practised the various enterprises were so interdependent as to render the allocation of overhead charges, as well as the determination of benefits mutually incurred or received, very difficult, and to a large measure artificial. An "enterprise account" was made up on its debit side of the value of the stock-in-hand at the start of the year, plus its prime costs; its credit side included the value realized by the produce disposed of during

TABLE IV.—SUMMARY OF FINANCIAL RESULTS, 1924-1932

	1924- 25	1925- 26	1926- 27	1927- 28	1928- 29	1929- 30	1930- 31	1931- 32	Total
Surplus from	£	£	£	£	£	£	£	£	£
(1) Sheep	835	498	-228	150	290	91	131	243	2,010
(2) Sale crops	449	647	550	666	977	578	319	218	4,404
(3) Cattle, pigs & horses	16	179	138	-17	47	46	62	13	484
GROSS SURPLUS	1,300	1,324	460	799	1,314	715	512	474	6,898
Less overheads, rent and rates	614	700	714	732	688	637	572	608	5,265
NET SURPLUS	686	624	-254	67	626	78	-60	-134	1,633

the year, plus the value of the produce on hand at the end of the year. The balance of these two constituted the "surplus" or "deficit" on the particular enterprise concerned. The various enterprise surpluses were then balanced against the general overhead costs to give the financial results of the whole farm.

Over the eight years, the total net surplus obtained was £1,633, and this had to meet interest on capital, remuneration of management, and profits. The net surplus varied considerably from year to year. Thus in the first two years of the period, and in 1928-29, a surplus of over £600 was realized, in 1927-28 and in 1929-30 the surplus was under £100, while in the three years 1926-27, 1930-31 and 1931-32 actual deficits were recorded. It is necessary to point out that these year-to-year results were influenced, to some extent, by differences in the quantity of stock in hand at the annual valuations, values having been kept constant throughout. This applies more particularly to the surplus of £626 in 1928-29, which was largely a result of the realization in that year of a considerable carry-over, particularly of wheat and oats, from the previous year. Apart from this, however, the annual figures shown provide a fairly good indication of the annual trend of the financial results.

During the period, 63·8 per cent. of the total gross surplus came from sale crops,* 29·1 per cent. from sheep and 7·1 per cent. from cattle and pigs. These figures are in sharp contrast to those showing the percentage distribution of the gross income given above, for they show that the sheep

* The total surplus from sale crops was made up thus: barley, 41·2 per cent.; wheat, 22·3 per cent.; oats, 20·1 per cent.; straw, 10·3 per cent., and hay, 6·1 per cent.

enterprise (which is the pivot of the farming system) contributed only 29.1 per cent. of the gross surplus as against a contribution of 63.8 per cent. from sale crops. It is realized that these figures do not tell the whole story of the relative "profitability" of sheep and of crops, for in the accounts the sheep were not credited with any manurial residues, nor was any charge made against the crops for manurial benefits received by them from the sheep. It is necessary, therefore, to examine the position more closely.

Sheep versus Corn.—In Table V, the annual surplus per acre from sheep and from cereals are shown side by side.

TABLE V.—SURPLUS PER ACRE FROM SHEEP AND FROM CEREALS

					Sheep			Cereals		
					£	s.	d.	£	s.	d.
1924-25	..	..	..	..	3	15	7	3	4	7
1925-26	..	..	..	..	2	7	8	3	3	4
1926-27	..	..	..	..	-1	3	3	3	2	10
1927-28	..	..	..	..	0	15	1	6	0	10
1928-29	..	..	..	..	1	13	3	4	14	6
1929-30	..	..	..	..	0	9	11	4	2	10
1930-31	..	..	..	..	0	14	4	2	4	9
1931-32	..	..	..	..	1	4	6	1	2	5

WEIGHTED AVERAGE.. .. £1 5 9 £3 7 10

In arriving at the figures in this table, the actual acreage utilized each year by the enterprise concerned was considered. In the case of sheep, the total acreage was adjusted to bring the downland area into units roughly comparable to the other land on the farm. The table shows that cereals yielded an average surplus of £3 7s. 10d. per acre utilized for growing them, as compared with a surplus of £1 5s. 9d. per acre used by sheep. It is interesting to note that, on this basis, the sheep occupied the superior position in both the first and last year of the period.*

To arrive at a closer approximation of the "profit" on each of the two enterprises, two further factors should be taken into account, viz., the apportionment of overhead charges and the apportionment of the estimated value of manurial residues. (It is impossible even to attempt to put a financial value on "the at-present-inimitable effects of sheep-treading on light-land.") Over the eight years, general overhead charges, rent and rates averaged £1 10s. 3d. per adjusted acre of the farm. Over the eight years, also, the

*The relative improvement in the sheep position in 1931-32 was partly due to the low yield, comparatively small sales and the low prices of cereals, and partly to the reduction in sheep costs, particularly on foods.

total value of the manurial residues of the foodstuffs consumed by the sheep on the arable land was approximately £1,100, calculated according to the standard method. This is equivalent to an average annual charge of 19s. 2d. per acre against the corn crops, and to a corresponding credit of 14s. 1d. per acre utilized by sheep. These adjustments have been introduced into the calculation as given in Table VI, where the final

TABLE VI.—AVERAGE "PROFIT" PER ACRE FROM SHEEP AND FROM CEREALS, 1924-1932

	Sheep			Cereals		
	£	s.	d.	£	s.	d.
Surplus	1	5	9	3	7	10
Add value of manurial residues to sheep and deduct from cereals	0	14	1	0	19	2
	1	19	10	2	8	8
Deduct charge for general farm overheads	1	10	3	1	10	3
"PROFIT"	£0	9	7	£0	18	5

result is shown as a "profit" of 18s. 5d. per acre for cereals, and a "profit" of 9s. 7d. per acre on sheep. In view of the arbitrary nature of the calculation on which these figures are based, it would be unwise to enlarge on them. They are given only as an indication of what results would have been shown had a more orthodox system of accounting been followed. It is relevant, however, to state that, in spite of the apparent conclusion to be drawn from these figures, the farmer himself is still satisfied that he is right in regarding the sheep as the sheet anchor of his farming system.

Costs and Returns of Sheep.—Table VII shows the prime costs, returns and surplus of the sheep enterprise for each of the eight years, the figures being given per 100 ewes at lambing time.

TABLE VII. FINANCIAL RESULTS OF SHEEP, 1924-1932 (PER 100 EWES AT LAMBING TIME)

	Prime costs		Receipts	Surplus
	£		£	£
1924-25	461		704	243
1925-26	433		572	139
1926-27	685		620	- 65
1927-28	400		442	42
1928-29	412		495	83
1929-30	421		447	26
1930-31	447		485	38
1931-32	262		330	68
WEIGHTED AVERAGE ..	443		515	72

The variation from year to year in the prime costs per

100 ewes was almost entirely due to the variation in the figure for depreciation, and this, in turn, reflected variations in the number of sheep in stock at the time of valuation. The very considerable drop in costs for the last year, however, was only partly due to the valuation factor; it was also partly the result of a considerable reduction in the food bill, which, in turn, was due to an appreciable reduction in the costs of producing home-grown foods, particularly roots. The eight years' average figures of the various costs are given in Table VIII.

TABLE VIII.—AVERAGE PRIME COSTS PER 100 EWES, 1924-1932

	Per 100 ewes	Per cent.
Purchased foods	£155	35.0
Home-grown foods	183	41.3
TOTAL foods	338	76.3
Labour—Manual	66	14.9
Horse and tractor	9	2.0
TOTAL labour	75	16.9
Sundries	12	2.7
Depreciation	18	4.1
TOTAL	443	100.0

Feeding-stuffs alone accounted for 76.3 per cent. of the total prime costs, and home-grown foods accounted for over a half of the total feeding-stuffs bill. Of the £183 expended per 100 ewes on home-grown food, £126 was for roots, £26 for cereals, £20 for hay, and £11 for grass.* The average expenditure on purchased foods was £155 per 100 ewes, and most of this was incurred in the purchase of linseed cake and lamb cubes. Of the other items of cost, labour accounted for 16.9 per cent. of the total, depreciation for 4.1 per cent. and sundries (carriage, shearing, veterinary charges, etc.) for 2.7 per cent.

The charges from year to year in the returns per 100 ewes, shown in Table VII, were the result of two factors, viz., the numbers of sheep sold and the prices obtained. The influence of variations in output on the returns more or less counter-balanced the influence of variations in depreciation on the prime costs. The most important factor, therefore, which influenced both the gross returns and the surplus, was the movement of prices. Table IX shows the average prices obtained each year for the various categories of sheep and for wool.

* Home-grown cereals fed to sheep were charged at their food values; all other home-grown foods were charged at prime costs.

TABLE IX.—AVERAGE PRICES OF SHEEP AND WOOL, 1924-1932

		Draft ewes			Fat lambs			Ewe lambs			Ram lambs			Price of wool per lb.
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	
1924-25	..	6	3	7	3	8	5	4	19	9	5	5	5	28½
1925-26	..	4	19	10	3	12	8	4	5	6	5	3	2	22½
1926-27	..	3	13	10	2	18	10	3	1	4	10	18	4	19½
1927-28	..	3	11	2	2	17	6	3	19	4	8	12	11	21½
1928-29	..	3	18	0	2	18	7	3	4	1	7	16	0	24
1929-30	..	3	4	10	2	10	3	2	17	4	9	11	5	19½
1930-31	..	4	0	9	2	12	3	4	1	3	6	8	0	13
1931-32	..	3	9	11	2	4	11	2	12	7	7	11	3	9½

In the case of fat lambs—the most important product—there was a range of 27*s.* 9*d.* per head between the highest and lowest average annual price realized during the period. For draft ewes, the range was 58*s.* 9*d.* per head, and, for ewe lambs, it was 47*s.* 2*d.* per head. The lowest average price for each of these three categories occurred in 1929-30 and in 1931-32. The average prices for ram lambs show still greater fluctuations, and these reflect the conditions obtaining in the trade for pedigree stock during the period. The movement of wool prices shows a more depressing downward tendency than even those of sheep, relieved by a slight improvement in 1927-28 and in 1928-29, but reaching the relatively low figure of 9½*d.* per lb. for the 1931-32 clip.

Costs and Returns of Cereals.—The prime costs, yields, prices, and surpluses per acre of the three cereal crops are shown in Table X (p. 824). The figures given apply to the crops of a single season, irrespective of the financial period in which they were sold.

With the exception of the first year, the best results were obtained throughout from the barley crop, and, if more land had been suitable, a larger acreage of barley would have been grown. A good sample of malting barley was produced, and this was sold to a local brewery, all barley not up to malting standard being used on the farm. Over the whole period, 80 per cent. of the barley crop was sold, 89 per cent. of the wheat crop, but only 30 per cent. of the oat crop. The average surplus over prime costs for the eight years amounted to £4 4*s.* 2*d.* per acre for barley, and £3 4*s.* 10*d.* per acre for oats, and (for the first seven years only) £3 17*s.* 2*d.* for wheat.

Table X shows that there were considerable year-to-year variations in the prime costs of growing each of the three crops, there being no tendency in favour of any one crop.

TABLE X.—FINANCIAL RESULTS OF CEREALS, 1924-1932

Crop year	WHEAT					BARLEY					OATS				
	Acres	Prime costs per acre	Yield per acre	Price per cwt. sold	Surplus per acre	Acres	Prime costs per acre	Yield per acre	Price per cwt. sold	Surplus per acre	Acres	Prime costs per acre	Yield per acre	Price per cwt. sold	Surplus per acre
1924	35.75	£ s. d. 4 0 0	cwt. 16.1	£ s. d. 12 11	£ s. d. 7 15 8	73.0	£ s. d. 4 4 9	cwt. 15.6	d. 11 3	£ s. d. 3 12 5	56.50	£ s. d. 3 17 9	cwt. 16.9	£ s. d. 10 8	£ s. d. 3 10 10
1925	18.75	4 8 0	9.8	10 0 0	0 9 3	74.5	3 19 6	17.2	10 3 4	10 3	49.50	4 4 0	18.9	10 0 4	2 10
1926	43.00	3 17 5	16.4	12 9	6 10 9	68.3	4 6 4	15.3	11 10	4 18 2	42.60	3 12 8	13.5	—	1 10 4
1927	55.50	4 0 11	14.0	11 4	3 7 0	43.5	3 17 4	18.2	12 10	7 8 8	38.00	3 11 10	18.6	11 3	4 16 10
1928	71.00	4 10 4	17.1	11 10	3 14 9	29.0	4 6 7	22.0	11 6	7 18 1	55.00	4 7 1	18.8	10 0	4 5 1
1929	16.00	4 16 2	15.7	8 11	2 3 4	60.0	4 10 2	16.9	11 6	4 12 11	49.50	3 6 7	22.1	6 6	3 15 2
1930	47.50	4 7 11	17.1	6 6	1 3 7	58.8	3 1 11	12.2	9 1	1 19 8	30.50	3 0 3	18.9	7 0	1 3 3
1931	41.25	3 14 2	12.3	—	—*	59.0	3 4 0	10.7	9 3	1 7 1	26.25	2 18 4	12.5	8 2	0 14 3
Weighted Average	41.09	4 3 8	15.6	10 10	3 17 2	58.3	3 19 0	15.5	11 0	4 4 2	43.5	3 14 2	17.9	9 2	3 4 10

* None of the 1931 crop had been sold at the end of the accounting year.

For all three crops these variations in costs were mostly due to variations in the labour bill, and this, in turn, was influenced, partly by the field in which the crop was grown, and partly by weather conditions, particularly in so far as these affected the yield of both grain and straw. Details of the average costs for the eight years are given in Table XI.

TABLE XI.—AVERAGE PRIME COSTS PER ACRE OF WHEAT, BARLEY AND OATS, 1924-1932

	Wheat			Barley			Oats		
	£	s.	d.	£	s.	d.	£	s.	d.
Manual labour ..	1	3	9	1	2	6	1	0	9
Horse labour ..	0	15	8	0	16	6	0	13	1
Tractor labour ..	0	9	5	0	4	6	0	4	10
Total labour ..	2	8	10	2	3	6	1	18	8
Seeds ..	0	15	3	0	15	0	0	16	7
Artificial manure ..	0	1	4	0	2	7	—		
Thatching and threshing	0	18	3	0	17	11	0	18	11
TOTAL ..	£4	3	8	£3	19	0	£3	14	2

There was not much difference between the three crops in either the total costs per acre or in the individual items of costs. Labour, which accounted for more than half of the total costs of all three cereals, showed the greatest variation, ranging from 48s. 10d. per acre for wheat to only 38s. 8d. per acre for oats. The average expenditure on seeds, as well as on post-harvesting operations, were much the same for all three crops. The low expenditure on artificial manures (there was none in the case of oats) reflects the importance of sheep as fertility agents.

Variations in yield were of much greater importance than were variations of prime costs. Thus the range between the highest and lowest yield per acre was 7.3 cwt. for wheat, 11.3 cwt. for barley and 9.6 cwt. for oats. If this variation in yield is translated into terms of money, on the basis of the average prices obtained for each cereal, it would in itself affect the returns by approximately 79s. 0d. per acre for wheat, 124s. 3d. per acre for barley, and 88s. 0d. per acre for oats.

Although the low prices ruling throughout the period were a major factor in deciding the financial returns from cereals, prices, as such, did not exert a fluctuating effect on the returns from year to year. In the last years of the period, however, the big drop in price almost entirely accounted for the depressed surplus from wheat, while, for 1930 and 1931, also, a very low price, coupled with a poor yield, combined to bring about a serious slump in the surplus from barley.

On this farm, practically all the straw produced was usually for sale. Unfortunately, during the first year of the period, the usual market—the Channel Islands—was cut off as a result of Foot-and-Mouth disease restrictions, and it was only in the later years that the farmer was able to find an alternative market. The actual sales of straw per acre of cereals in each crop year were as follows :—

					£	s.	d.
1924	..	..	..	..
1925	..	..	..	..	0	2	6
1926	..	..	..	..	0	3	6
1927	..	..	..	..	0	13	8
1928	..	..	..	..	0	14	1
1929	..	..	..	..	1	14	4
1930	..	..	..	..	1	13	1
1931	..	..	..	..	0	10	4

Costs and Returns of Cattle and Pigs.—Although both cattle and pigs occupied only minor positions in the farming economy, they nevertheless provided a useful source of income without necessitating any considerable outlay. The financial results are summarized in Table XII.

TABLE XII.—FINANCIAL RESULTS FROM CATTLE AND PIGS, 1924-32

	CATTLE			PIGS		
	Returns	Prime costs	Surplus	Returns	Prime costs	Surplus
	£	£	£	£	£	£
1924-25 ..	50	42	8	117	109	8
1925-26 ..	122	11	111	114	67	47
1926-27 ..	246	232	14	118	45	73
1927-28 ..	353	357	- 4	17	30	- 13
1928-29 ..	115	89	26	114	93	21
1929-30 ..	140	116	24	58	36	22
1930-31 ..	138	87	51	54	43	11
1931-32 ..	191	158	33	15	35	- 20
TOTAL ..	1,355	1,092	263	607	458	149

Thus, during the eight years, cattle and pigs together provided a surplus of £412 over the prime costs incurred. The cattle concerned were a few heifers bought in and reared as down-calvers, and these were kept mostly on grass which would otherwise not have been utilized. Pig-keeping was also on a modest scale, a few breeding sows being kept and the progeny sold as stores. The accommodation is at present limited, otherwise, in view of the supply of tail-corn available, it might have been worth while paying more attention to pigs.

Conclusion.—The chief problem of management in the type of farming here discussed is to maintain an optimum balance between sheep and corn. There are two aspects to this problem. In the first place, a physical balance has to be struck; too few sheep might seriously diminish the capacity of the soil to produce corn crops, while too many sheep might make the land "sheep-sick." In the second place, this physical balance must be related to current price conditions if the farm is to prove a financial success. It is the conflict between the tempo of these two processes which makes the farmer's task particularly exacting. On this Dorset farm—for many reasons, both financial and otherwise—it was decided to forego any major change in policy during the period, notwithstanding the considerable price fluctuations that occurred. Indeed, the chief interest of its history for the past eight years lies in showing how a technically efficient sheep and corn farmer, working on orthodox lines, fared during a period notorious for its disorganized financial movements.

STRAW AND CROP RESIDUES AS ORGANIC MANURES

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THE value of organic matter in the soil is generally recognized among farmers, and the usual systems of husbandry, involving the return of the straw in the form of farmyard manure, the ploughing in of leys, and the feeding of green crops, all serve to maintain the supply of soil humus. These practices preserve the land in good texture, enable it to make the best use of the available water supply, and provide a steady and rather lasting source of nitrogen and other nutrients. They build up condition, leaving to the artificial fertilizers the task of providing that more ready and available supply of plant food necessary to meet the demands of the rapidly-growing crop.

From time to time, farmers have been impressed by the remarkable way in which cereals and mangolds have been grown continuously for long periods at Rothamsted and elsewhere, using only chemical fertilizers; and some of them have adapted this principle to their conditions and carried on a system based on artificials without live stock with a considerable measure of success. A deep soil of good body and first-class water relationships lends itself to this scheme, particularly if it enjoys a well-distributed rainfall. On light

thin soils, the supply of organic matter is much more important, and artificials only, unsupported by dung or by folding, have not found favour in such circumstances.

Until recently, such systems were only of academic interest, but, with the introduction of mechanized corn-growing, and its spread to a range of soils on which the maintenance of the humus supply would normally be regarded as essential, the problem has taken on direct interest and importance. On a given soil, suitable for large-scale cereal production, can fertility be maintained by chemical fertilizers alone? If not, must the dung cart, possibly mechanized, be called in to supplement the artificials, or will it be possible, by returning the straw to the soil direct, or by some green manuring system, to preserve the land in good cropping condition?

Such questions as these are still to be answered in many districts. The various pioneers are feeling their way towards a solution in their individual circumstances, and experimental stations are making a careful study of the possibilities. On the technical side, a large amount of work has been done on the decay of organic matter in the dung heap, the compost heap, and the soil, and, as a result, scientific methods of preparing straw manure have been worked out and some of the rather erratic results of green manuring practice have been explained. A few notes on the utilization of farm wastes and straw as sources of organic matter may be of interest as indicating some of the principles that will undoubtedly operate in the larger questions of husbandry still to be solved.

It has long been observed that the addition of raw straw to soil, far from exerting the beneficial effect that might be expected from the organic matter, actually had a depressing action on the crop immediately following. Grass, clover, and fresh weeds did not behave in this way and were usually favourable in their effects. On the other hand, straw, when well rotted in the dung heap, became the most valuable manure. With increasing knowledge of the functions of the soil bacteria and fungi, it became possible to assign reasons for these facts.

Fresh organic matter when turned into the soil serves as a food for micro-organisms. It forms, so to speak, the carbohydrate part of their diet, and, according to the amount of nitrogen contained in the organic matter, it may or may not supply the needs of the bacteria in respect of nitrogen also. If, as in the case of straw, there is a great excess of carbohydrate over protein, the organisms, in their endeavour to maintain their nutritional balance, will abstract some nitrogen

from the surrounding soil, thereby competing with the crop for nitrate and temporarily depressing fertility. When the balance of carbon and nitrogen is about that required to enable the bacterial decomposition to proceed, the soil supply of nitrate is little affected. Finally, when the organic matter turned-in contains an excess of protein in relation to carbohydrate, the organisms produce more ammonia than they require for their own nutrition and the level of available nitrogen in the soil is raised. The material then acts as a nitrogenous manure. The carbon-nitrogen ratio, as it is called, a rough measure of the proportion of easily decomposable carbohydrate to readily available nitrogen, gives a good indication whether a given substance will act favourably or otherwise immediately after its incorporation in the soil. The nitrogen abstracted from the soil during the decay of straw and other materials rich in carbohydrate is not to be regarded as a dead loss. It is in fact stored up in the bodies of the micro-organisms, and on their death is slowly restored to circulation.

The preliminary rotting of organic matter, before this is applied to the soil, has long been recognized as most essential, and directions for the management of manure heaps and compost heaps are found in the early writings. Thus moisture and nitrogenous substances—usually liquid manure or dung—were recommended to promote the decay of the raw organic material in compost heaps to form a mild organic manure of immediate fertilizing value.

Working at Rothamsted in 1918–20, H. B. Hutchinson and E. H. Richards made a study of the decomposition of cellulose by micro-organisms and, as a result, developed a process for the artificial rotting of straw under controlled conditions. Their early work is described in an interesting paper published in this JOURNAL, August, 1921, p. 398. The procedure consists in putting up straw in shallow layers in clamps, each layer being treated with the correct quantity of a reagent supplying available nitrogen for the micro-organisms, as well as a little phosphate and enough basic material to preserve a neutral reaction. The mass is maintained moist by watering and no attempt is made to exclude air by compression. One or two turnings and watering are desirable to produce a really first-class and uniform product. The reagent, Adco, is being used on a large scale, chiefly abroad, but to some extent at home. The process is a very flexible one in that organic wastes of all kinds may be treated on the same principle, although economy may often be effected by modifying the nitrogen

concentration to suit the carbon-nitrogen ratio of the material being converted. Clearly the main difficulty in the making of Adco manure is the provision of the necessary water to moisten the heaps, for about 800 gallons are required for each ton of straw, making about 3 tons of the finished product. Only in specially favourable conditions will a water supply be available at practically no cost, as, for example, where water is laid on and the heaps can be sprayed as required with a sprinkler. The Adco process lends itself to mechanization in that the initial dose of water and the whole of the chemicals may be added by a special machine to coarsely chaffed straw as it leaves the threshing machine. The treated straw is mechanically conveyed to the compost heap. A note on this procedure will be found in this JOURNAL, January, 1930, p. 993.

The question naturally arises whether it may not be possible to cause straw to rot down in the soil, utilizing the soil moisture and supplementing, by added artificials, the soil supply of available nitrogen and phosphate, which the organisms would otherwise deplete in decomposing the straw. The idea is an attractive one, for the treatment of straw on the land, with a mixture of artificials, could be made a large-scale, mechanized operation. The best method of preparing and spreading the straw to receive its top-dressing, and the most practicable method of turning-under the treated mass, still remains to be worked out. In the meantime, the action of treated straw, as such, is being studied at Rothamsted and elsewhere.

A note on a Rothamsted rotation experiment testing this point may be in place here, but it must be borne in mind that the figures quoted are of the most preliminary nature, for the design of the experiment does not permit of numerical analysis until after some years. The experiment is conducted on the crops of a four-course rotation and tests three straw manures, namely, dung, Adco made in the heap, and straw ploughed in after top-dressing with complete artificials. These are compared with artificials without any organic matter. The organic manures are so applied as to provide equal amounts of organic matter, and all treatments are equalized in total nitrogen, phosphoric acid, and potash. The organic manures and the phosphatic part of the artificial mixture are applied to their appropriate plots in one dose to last for five years. The nitrogen and potash of the artificial mixture is applied in five equal dressings—one every year. The experiment is designed to test first year and residual effects of the above fertilizers. As a

rough indication of how the experiment is working out, the first year's effect averaged for 1930 and 1931 and the first residual year 1931 are given below. The crop yields and the estimated total dry matter are given for the first year, while for the second year only the estimated total dry matter is given, since the yields of only a small number of plots are available.

	1st Year Effect, 1930-1931						Mean dry		
	Swedes		Barley			Wheat		matter (all	
	Roots	Tops	Grain	Straw	Seeds	Grain	Straw	crops)	Per
	tons	tons	cut.	cut.	cut.	cut.	cut.	cut.p.a.	cent.
No manure	5.48	2.13	11.9	25.8	22.6	12.8	22.5	24.8	100
Artificials	9.91	3.60	23.9	30.6	32.7	20.0	32.7	37.4	150
Dung ..	11.00	3.48	21.1	36.6	34.7	18.9	36.4	39.7	160
Adco*	11.44	4.83	22.9	30.3	35.5	18.5	36.5	39.8	160
Straw ..	11.80	4.90	22.3	27.6	50.5	22.9	40.1	44.7	180

* The Adco, as made in the heap, receives a further addition of artificials to bring it up to the standard of nutrients laid down for the other plots.

The effect of these manures in the year after application may be compared with the unmanured plots on a basis of mean dry matter per acre as follows:—

	Mean dry matter		Per cent.
	cut.	per acre	
No manure	26.0	100
Dung	35.5	137
Adco	33.4	128
Straw	32.0	126

The indications are that Adco and straw, when made up, by suitable additions of artificials, to equal dung in total nutrients, have given crops of about the same size as ordinary dung in the first year. In the second year, they have shown residual effects possibly not quite so great as dung. On the Rothamsted soil, the artificials have promised well in the beginning of the experiment, but it remains to be seen whether the plots receiving organic matter will be better maintained.

The addition of nitrogen to straw is essential. In the above experiment, the amount of nitrogen added is approximately $1\frac{1}{2}$ cwt. sulphate of ammonia per ton of straw. It is possible that the need for extra nitrogen could be reduced by undersowing the cereal crop with a legume, such as trefoil, which, when turned-in with the straw, would do something to grade up the mixture in nitrogen. Young trefoil contains about 4 per cent. of nitrogen in the dry matter as compared with 0.5 per cent. for straw. Even Italian rye-grass, with about 2.5 per cent. of nitrogen, would help; but it must be remembered that, in this instance, the nitrogen comes entirely

from the soil. Such a plan might increase the concentration of nitrogen in the neighbourhood of the straw, but would not increase the total quantity present.

It is, therefore, suggested that the making of composts in heaps and the ploughing-in of straw, after suitable treatment with artificials, are promising methods of maintaining the organic matter in the soil of holdings that are not using farm-yard manure in the ordinary way. Even when dung is made, the Adco heap provides a means of converting waste material, not suitable for litter, into a valuable organic manure. Stack bottoms, spoilt hay, waste silage, hedge clippings, weeds and the like may all be used in this way.

A further possibility in the maintenance of organic matter is the use of green manures. These differ from straw in that, when turned-in before they become woody, the carbon-nitrogen ratio is more favourable for decomposition, and extra nitrogen should be unnecessary, especially when legumes are employed. Two methods suggest themselves as being worth a trial in connexion with the present growth of cereals without organic manure: (1) the under-sowing of the crop with a cheap seeds mixture, such as Italian rye-grass and trefoil; or (2) the taking of mustard at the end of a summer fallow. Under favourable conditions the decay of the green crop is rapid—good aeration, sufficient moisture, and a warm soil temperature are all helpful, and these conditions are usually found in autumn. Indeed, on very open soils, as at Woburn, it has been shown that the formation of nitrate from green mustard and from tares is so rapid that more or less serious loss can occur in the drainage before the following wheat is in full growth in spring. On heavier soils, where decomposition would be slower, this is less to be feared. In any case, the soil gains in organic matter.

In market garden and horticultural practice, the composting of the numerous vegetable waste materials is a question of considerable importance. Except on the largest holdings, practically no live stock is kept and no straw is grown. The treatment of pea and bean haulms, leaves of brassicas and so forth, presents no difficulties, and such material, being richer than straw in nitrogen, requires a less concentrated Adco reagent for its conversion. The quality of the resulting compost is improved by the addition of a certain amount of more woody and fibrous material. Leaves, hedge trimmings, brassica stalks and the like may be got rid of in this way when worked in with the softer products.

One point in connexion with these composts deserves notice.

When a special reagent, or an addition of artificials, is made to facilitate decomposition, the added nutrients serve to increase the manurial value of the original material; but, instead of remaining in the mineral condition, the nutrients are to a large extent converted into the organic form and exhibit that mildness of action and residual effects which is so often sought in horticulture. The organic matter acts as a shock absorber, and the forcing, or even in certain cases the injurious, action of a heavy dose of mineral plant food is avoided, and the nutrients are stored up for gradual release over a period.

* * * * *

ACARINE DISEASE OF BEES

Colonel H. G. HOWORTH, C.M.G.

ACARINE disease is due to the invasion of the tracheal system of the hive bee by a parasitic mite (*Acarapis Woodi* Rennie) that, up to the present, has been found in no other insect. The mite lives in the larger breathing tubes in the thorax of the bee, passing, in this situation, through the stages of egg, larva and adult, the migrating adult female being the only stage in which it is found outside the bee. There is, however, a very similar mite that lives and breeds on the bee externally.

Morganthaler has proved that worker bees are not liable to become infested before emerging from their cells, and that the migrating female mite will only enter a very young bee, almost invariably choosing one that is not more than four days old. He says that "she would rather die than enter a bee more than thirteen days old"; and he also tells us that she lays from five to seven eggs, and may become a grandmother in about a fortnight.

Rennie states that the mites can live but a very short time apart from a bee, and for not more than a week in a dead one. It is safe, therefore, after a reasonable interval, to re-use all the components of a hive that has housed an infested colony. Morganthaler has shown that combs containing brood may be safely transferred from an infested colony to a clean one after shaking off the bees.

Workers, drones and queen are all liable to infestation. As the queen is not called upon to fly, she will usually be found alive, even if infested, among the last handful of the survivors of a moribund colony.

Nature of the Attack.—The mites and their larvae feed upon the blood of the bee by piercing the breathing tubes

with their boring and sucking mouth parts. Very soon after first infestation, the number of mites is sufficient to choke these tubes and to cause structural damage. Normal breathing is hampered and the bee is weakened. The fitness of the foragers for the arduous work of carrying heavy loads long distances will be impaired at an early stage of infestation ; and, although the bees may appear to be strong and active on the alighting board, most of them will die prematurely in the fields.

Acarine disease reduces the average useful life of the foraging bees and, therefore, the efficiency of the colony as a producer of honey ; and the mischief has generally been done before the bee-keeper detects any signs of the disease. The bees that survive until the disease has developed to the final stages (when their breathing tubes are crammed with mites in all stages, or have become black and brittle) become incapable of flight and can only crawl. Crawlers will be seen after a spell of weather in which there has been little flying ; they leave the hive beating their wings, one or more of which may be carried at an abnormal angle with the body, and their abdomens are distended by dysentery. Falling to the ground from the alighting board, they hurry away from the hive and, when exhausted, climb to the tops of grass stems, or huddle together in miserable groups. Each of these crawlers has reached a condition in which it will probably have passed on infestation to many young bees, and their stained breathing tubes will often be found deserted by the female mites in consequence. When the percentage of infested bees is high, mass-crawling occurs and thousands of bees, in the condition described above, will be found for many yards around the hive. A colony from which mass-crawling has occurred should be regarded as incurable ; the crawlers should be picked up and destroyed, together with the bees remaining in the hive.

There is considerable variation in the incidence of infestation within colonies, in the intensity of the attack, and in the rate at which it spreads. Much depends upon the degree of the original infestation, the size of the colony, the rate at which the breeding of both the mites and bees is progressing, the season of the year, the frequency of fresh introductions of the parasite from outside, and other factors.

Detection of the Disease.—Bee-keepers need to maintain constant watch on their colonies, not only for crawlers but for other signs of debility, such as listlessness and inactivity ; the last-named becomes evident if relatively large numbers

of the older bees, which should be foraging, remain in the hive on fine days. It must be emphasized, however, that it is dangerous to rely upon outward signs as evidence of the presence or absence of Acarine disease. Crawling and inactivity may be symptomatic of other diseases, notably of simple dysentery; and even experienced bee-keepers may notice nothing wrong with a colony in which 50 per cent. of the bees are infested. The cessation of crawling, moreover, is often mistaken for a cure.

The only reliable method of diagnosing Acarine disease is by micro-examination: the cutting up of the bee, extraction of its breathing tubes, and the scrutiny of these under a low-powered lens for the presence of staining or mites. Bee-keepers' Associations and many of the County Councils arrange for this to be done free of charge. The operation is a very simple one, and the apparatus required need cost no more than three shillings.

Spread of the Disease.—As stated, Acarine disease is spread from bee to bee in the colony by the migration of adult female mites that enter the very young bees. It is spread from hive to hive:—

- (1) By robbing—the chief means by which all bee diseases are spread. The bee-keeper's first duty, both for his own and his neighbours' sake, is to watch closely for signs of robbing and to take immediate steps to control it.
- (2) By drifting, notably on the part of the drones which are allowed to enter any hive, but also by workers which are admitted to neighbouring hives much more freely than is generally recognized. For this reason, it is important that hives of the same pattern, or painted the same colour, should not be placed close together or set in rows. An irregular grouping of hives is preferable, and bushes and other landmarks about the apiary are helpful.
- (3) During natural swarming, which, it should be recognized, affords opportunities for the mingling of bees of different colonies. On such occasions, undoubtedly, relatively heavy infestations of clean colonies may take place.
- (4) By crawlers.

The disease is spread from apiary to apiary, similarly, by robbing and by the drones. It may also be introduced by new colonies, nuclei and swarms that are infested, and a statement, based on examination by a qualified person, that the stocks are free from Acarine disease, should be demanded when these are purchased. A sample of bees from every captured truant swarm should be examined at once.

The Frow Treatment.—The certain destruction of the mite and its brood *in situ* (within the breathing tubes of the bee) is a problem that has been solved by Frow. It is effected by

administering a volatile liquid, the vapour from which, mixed with air, is breathed by the bees and affects them in such a way as to kill the adult and larval mites and their eggs. It does this with certainty within a fortnight of the first dose, if used in suitable strength. The close relationship of the bee and the pest, however, necessitates very great care and attention to detail in the use of the prescription to avoid injury to the bees.

The strength of the dose is determined by the vapour density, that is, the proportion of the vapour to the air in the hive. This is not constant for a given quantity of the liquid used, but varies with the area from which the evaporation takes place, the temperature, the air space within the hive, and the rate at which the vapour-laden air is changed by ventilation, etc. The temperature, which determines the rate of evaporation of the liquid doses, is due not only to seasonal and climatic conditions but also to the reactions of the bees to a disturbing influence; the presence of an irritating vapour, for example, will result in a rise in temperature. A high temperature, too, is maintained whenever brood is being raised. Since warm air rises, it follows that a volatile dose applied above the bees will evaporate more quickly (and be converted into a stronger vapour dose) than one applied on the floor-board; also that the strength of the vapour dose in the former instance will be more likely to vary in different hives. The air space varies with the relative size of the hive, and in this connexion a standard treatment will be more severe in skeps than in frame hives; it also varies with the relative amount of space occupied by bees, brood and stores. Ventilation is governed by the effective area of entrance, by the exposure of the hive to wind currents, and by the action of the bees when ventilating by fanning. Another factor, of which there are indications, lies in variations in the reaction to treatment of individual strains of bees, possibly due to temperamental differences.

Everything possible must be done to reduce the effect of these variables in the endeavour to work to a standard vapour-density. Bee-keepers should, therefore, *adhere closely to the following instructions even if the reasons for them are not clearly apparent*. The procedure is based on prolonged experiments carried out, in 1927-28, in cold weather, and confirmed by results obtained during the following winters at thousands of colonies treated in this country and in Switzerland.

Effect of the Treatment on the Bees.—In winter, the first dose sometimes causes excitement. After a few days, the

bees become torpid ; a number may drop from the cluster on to the floor-board and, if not removed, may interfere with ventilation. Torpidity may last for several weeks.

A colony may take the treatment badly. There are instances in which the bees have deserted the hive on a warm winter's day. In other cases, acute dysentery has developed and the colony has died shortly after treatment. Any predisposition to dysentery, caused by disease, or by poor bee-keeping, which has resulted in dampness or the presence of unsealed winter stores, is detrimental to a successful treatment.

The Best Time for Treatment.—Treatment in the active season sometimes causes the bees to cluster outside the entrance to the hive. Torpidity is not so pronounced and, as many bees fly, it may be assumed that another factor is introduced when infested bees take their parasites out for an airing. The Frow treatment induces robbing to an extent that is very difficult to control except in a honey flow or in very cold weather. It is uncertain whether this is because the odour of the vapour is attractive or is due to the poor defence put up by the torpid bees. Robbing is the principal cause of the loss of colonies after the Frow treatment. A colony in a torpid state can, however, be protected by an entrance strip of perforated zinc, with the bee gap closed with a stone.

In the active season, too, a large proportion of the brood present at the commencement of treatment is killed and, although the queen may continue to lay, very little brood is reared during the treatment. The normal output of brood, extending over a period of five weeks, will be reduced to a serious extent if treatment is applied in the brood-rearing season. This destruction of brood, and the incidence of robbing, render treatment in the active season almost impossible and, certainly, seldom profitable.

On the other hand, in winter, there is little brood to kill, robbing can be controlled, the bees are automatically confined to the hive, they are clustered, already semi-torpid and, unless carelessly handled, do not become unduly excited. The temperature of the hive is low and fairly constant, and temperature and ventilation are not likely to be influenced by the action of the bees. Many causes of variation in vapour-density, therefore, are absent in winter, and others can be controlled by procedure—such as by adopting a standard material for the vaporizing-liquid pad, by placing the pad on the floor-board where the temperature is most constant, by using an empty chamber below the brood box, and by

adopting, as a standard entrance, a strip of perforated zinc across an opening along the whole front of the hive. The winter months, then, are indicated as the best time for treatment, which should be carried out in the coldest possible weather, and with the least possible disturbance to the bees when administering the doses.

Destruction v. Treatment.—When deciding whether to kill or treat an infested colony, it should be remembered that treatment will not restore to health a bee that has lost its power of flight; those in the initial stages of Acarine disease, however, appear to recover after the death of the mites. In one colony, treated experimentally in September, 10 per cent. of the flying bees, when examined in the following April, were found to have the remains of dead mites in their breathing tubes. A colony, infested to the extent of 45 per cent. and treated in December, yielded a 90 lb. surplus in the following summer. The cost of treatment is small and, although a number of heavily-infested colonies may not survive, it is considered worth while to apply the Frow treatment to every infested colony that has not reached the mass-crawling stage.

In estimating the percentage of the bees that are infested, it is necessary to examine a sample of bees from the combs, or of foragers. In a sample of crawlers, practically every bee will be found heavily infested.

Preparations for Treatment.—The first warning of infestation—the appearance of crawlers—appears, unfortunately, at seasons when it is too late to prepare for treatment (late autumn) or to carry it out (early spring). Bee-keepers are advised, therefore, to act on the assumption that every colony may be infested, and to get a sample from each examined microscopically before the end of September. Each hive, containing a colony in which the presence of mites has been detected, should be prepared for treatment before packing it down for the winter.

At least one set of appliances (pad, zinc entrance and graduated measure) should be purchased; these are stocked by all manufacturers of bee-keeping appliances. The material of the pad is important; it should be under-carpet felt. A pad must not be re-used for the treatment of a second colony until all the odour has disappeared. The hive may need attention to ensure that the pad can be slipped in without disturbing the bees; it may be necessary to ease away a step between the alighting and the floor-board, or to remove

the porch if this restricts the width of the entrance. If the bees are wintered on 10 combs only, it is essential that an empty chamber be placed below the brood-chamber. This is advisable when the bees are on more than 10 combs, as it minimizes the possibility of the pad touching the bottoms of the frames or the cluster of bees when inserting or withdrawing it. An empty section rack or shallow-comb chamber, placed upside down, is suitable. If a shallow-comb super is used, the air gap at the back, between it and the floor-board, must be closed: there must be no exit for the vapour-laden air except through the entrance. A new calico or ticking quilt should be given; and the hive should then be packed down for the winter.

The ingredients for the Frow prescription, as under, should be obtained at the rate, approximately, of half an ounce for each colony:—

Nitrobenzene (oil of mirbane)	2 parts by volume
Safrol	1 part „
Petrol (Shell No. 4 or commercial)	2 parts „

It is important that none of the "Special" brands of petrol should be used.

The mixture is poisonous and highly inflammable, and should be handled with great care. Even the vapour from it may cause a headache; no lights must be brought near it.

Application of the Treatment.—The dose is one half-drachm (30 minims) of the preparation poured drop by drop on the pad and well-distributed over it. The pad should be inserted, and pushed to the back of the hive, when the zinc entrance should be slid into position *as gently as possible*. On each subsequent day, the zinc entrance and pad should be removed; a bent wire should be used to stroke out gently any moribund bees that lie on the floor-board. After distributing another dose on the same pad, the latter should be reinserted in the hive and the zinc entrance replaced.

Seven doses of the cure, each of half a drachm, should be given in this way on consecutive days. After the last dose, the pad should be left in the hive for three more days, being temporarily removed each day to stroke out moribund bees as described above. The treatment is then complete and the pad should be removed; but the removal of moribund bees from the floor-board should be continued if necessary.

If the number of bees so removed reaches 200 on any one day, and they are dysenteric, the colony will probably not survive further treatment. The bee-keeper must then decide,

from the degree of infestation, whether he will remove the pad or continue the treatment. A close watch should be kept for robbers. If they make an attack, the ends of the zinc entrance must be secured to the hive and the bee gap closed with a stone.

No signs of life may be observed for some weeks, but on no account should the hive be opened on the assumption that the colony is dead. The empty chamber must not be removed until the spring. It is desirable that a young queen should be introduced into the hive as soon as possible.

Sulphur Treatment.—The following adaptation of a method of using sulphur for Acarine disease (first suggested by Rennie) has been employed with success in Switzerland in apiaries to which it was not possible to make daily visits.

A roll of corrugated paper is soaked in a solution of saltpetre and dried, being afterwards soaked in a solution of flowers of sulphur in carbon bisulphide* and again dried. The roll is lighted, placed in a smoker† and three strong puffs are blown in at the hive entrance. This is done from 10 to 15 times on fine days.

Treatment by Oil of Wintergreen.—In a leaflet issued by the Staffordshire Education Committee, particulars are given of treatment by *methyl salicylate* (oil of wintergreen), which it is stated has given excellent results in that county when applied to colonies in the first stage of the disease.

Slow fumigation with oil of wintergreen is cheap and easily carried out without undue disturbance of the colony and little fear of tainting the honey. It can safely be recommended as a preventive measure for use during the winter, when the bees are virtually confined to the hive.

The only appliance needed is a small conical bottle of about 2 oz. capacity. In this, 1 oz. of oil of wintergreen should be placed, the neck being then plugged with a cotton wick, dipping down into the oil and protruding about 1 in. above the neck at the top of the bottle. The bottle is placed on the floor-board of the hive between the combs at the farthest point from the entrance. The quantity of oil stated above is sufficient to last through the winter; the bottle can be recharged in the spring if desired.

* Carbon bisulphide is highly inflammable; it is dangerous to bring it near a light in any form, and even a lighted cigarette may cause a serious explosion.

† An old smoker should be used, as the fumes are very destructive to metal.

The method of placing the bottle in position without disturbing the bees is as follows: the back of the brood-chamber should be lifted up gently and tilted forward; the bottle, with its protruding wick, should then be pushed up between the combs, the brood-chamber being afterwards gently lowered on to the floor-board, when the bottle will stand firm and upright.

Occasionally, it has been found that, in the autumn, the bees propolize over the wick, thus rendering the fuming process ineffective. To overcome this, it is suggested that the treatment should be supplemented by the use of a felt pad fixed on a wire and pushed into the entrance. A few drops of oil of wintergreen should be placed on the pad once a fortnight.

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THE IMPERIAL FRUIT SHOW, 1932

GROWERS, merchants, package makers, canners and the general public all combined to make the total of over 60,000 people who visited the 12th Imperial Fruit Show held at Birmingham in October.

Visitors sought information or interest in accordance with their needs, and their tour of the show was influenced by that fact. Professional growers, for example, were disposed to learn about the methods of judging, the best varieties of apples and pears to grow, the standard to be attained, and the best methods of packing. Many studied the strong and weak points of the exhibits, referring to the score card to note the marks awarded for packing, size, quality and skin finish. They probably wondered how it was possible to judge 3,400 packages of fruit in so short a time, and to have on sale on the opening day a printed score card showing in detail the marks for each exhibit.

The preponderance of Cox's Orange Pippin in the classes for dessert fruits was noteworthy, and it seemed astonishing that so many superb fruits failed to win a prize. In the class for 50 $\frac{1}{2}$ -boxes of dessert apples, no fewer than 210 boxes were "Cox's." Other dessert varieties, however, were not "out of the picture," for the "tray" class was won by a very excellent set of brilliantly-coloured Worcester Pearmain. Ellison's Orange and Laxton's Superb were shown in some quantity, and varieties in the "any other dessert variety" group included Allington Pippin, Charles Ross, Duke of Devonshire, Herrings Pippin, King of the Pippins, James Grieve, John Standish, Miller's Seedling, Ribston Pippin, Rival and Paraquet.

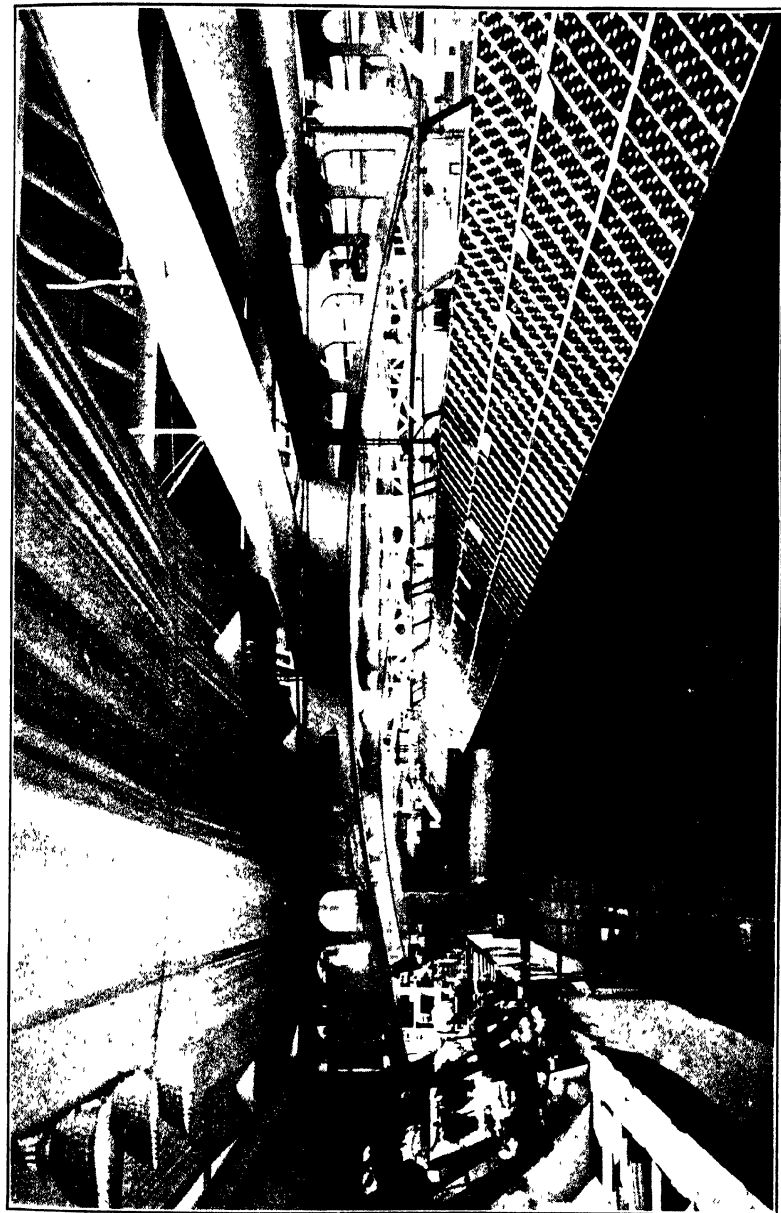
Bramley's Seedling was by far the most prominent variety amongst cooking apples, and the long row of boxes in the class of 50 boxes presented an impressive sight. Here, too, another aspect of fruit-growing thrust itself upon the thoughtful grower, for some entries consisted of an even sample of yellow-green fruit, while entries from other growers were made up of fruit having red-flushed cheeks. This would make the grower ponder upon the effects of manuring, soils and cultivation on the appearance of a crop; indeed, it was possible to recognize by their colour and "finish" the source of apples in many different classes. For instance, all the Cox's exhibited by Miss Cannell were lightly coloured—those by F. P. Norbury were deep red.

Professional growers were also able to meet those who were fortunate enough to win the big Empire prizes, and to discuss their technique, drawing conclusions for themselves as to possible alterations in their own programme for the improvement of their apple crop.

The entries of tray fruits were interesting. Here were 87 trays of Cox's Orange Pippin, each entrant exhibiting six trays, but using any method of packing he favoured. Some apples were set with the cheek uppermost, others were placed eye upward; in general the cheek-up pack was the more attractive. In many entries, including the prize-winning ones, each apple was set in a shallow cup of coloured paper, whose frilled edge made a frame round each fruit. Dark green, chocolate brown and lime green were among the colours used, and considerable ingenuity had been exercised to choose the colour best suited to the apples. The chocolate brown looked well with the dark apples and the lime green with the light apples. Where white papers were used the apples looked less attractive.

Other competitors had used no packing material, or had experimented with a "riff-raff" pack—where the apples were irregularly packed with twisted green paper. Wood-wool, where used as a packing material, gave excellent protection to the apples for travelling, but the packages were rather untidy in appearance.

Different methods of packing were used also for the pears in trays. Some competitors had used a simple 3-2 pack with the pears pointing either all in one direction or in alternating directions. There were trays with paper shavings or wadding as packing material, and others where fruit was packed in a paper cup or wrapper, while others had placed a removable frilling to border the box and between each row of pears.



The Imperial Fruit Show, Birmingham, 1932. On the right are the 50 half-box entries English dessert



THE BROADWAY IN LONDON, ENGLAND

Other classes in which growers were very interested were those for new packages and fittings for packing fruit. Among these were boxes with "panel" ends and interlaced chip wood ends, and collapsible fibre-board boxes. The class for novel cartons for apples included string-handled paper carriers, each holding about 1 lb. of fruit and of a length that just fitted into the width of a box. There were also cardboard boxes, wedged like books into the box, each with two ventilation holes in the bottom and a lid labelled "Cox's Orange Pippins." Further, there were punnets, 18 of which exactly fitted into a bushel box, and ingeniously designed cardboard baskets, fitting 9 to a bushel box. Fittings of corrugated paper to provide compartments for the apples like those in an egg box were shown, chip trays, wooden baskets with light wooden handles, fibre-board trays and various half-basket containers such as circular chip-wood half-barrels and Guernsey tomato boxes.

So great is the demand for information about fruit growing that growers stood in crowds round the stand of the Long Ashton Research Station to secure interviews with the research staff. The Staffordshire Farm Institute had an instructive exhibit, and near by were exhibited new varieties including specimens of Laxton's Epicure and Laxton's Fortune (both new varieties of promise).

Amongst the "trade" stands of special interest to the grower were those showing various sundries, such as new cultivators, new packages and apple graders. Opportunity was also given for growers to discuss with insecticide and fungicide manufacturers and their experts the relative virtues of the numerous new and established spray fluids available.

In this section of the trade much interest was evoked by an exhibit of "Frozen Fruit," suggesting to the grower yet another method of preserving his produce. By this method the fruit is frozen solid in factories and stored in the shops in a refrigerator until needed. It was interesting to hear that this method, already well established in the United States, has been satisfactorily started in England, particularly for supplying green peas in gallon cartons to the London hotels, many of which now have a standing order for a daily morning delivery.

At the Ministry of Agriculture's Marketing Stand were demonstrated the standardized methods of marketing. Besides the now well-known fruit packages there was an exhibit of graded cabbage lettuce and broccoli packed in the new crates

accepted for the National Mark Scheme. Progress having been made with fruit, the National Mark Scheme is now being extended to include vegetables, starting with lettuce and broccoli.

After a tour of the show, a grower would be convinced as to the best varieties for cultivation, what appliances he should choose, and how he could pack his produce to give the best possible impression and attract buyers.

Ordinary city consumers, so many of whom came to the show, had less of a definite purpose than the growers, but desired to learn something about the best fruits and to get what amusement he could from the many interesting stalls and exhibits. On entering the show, the consumer found himself in an old English market place, designed by the Empire Marketing Board. The stalls were arranged by all the fruit-growing Dominions and Colonies for displaying the fruits of the whole Empire. Many visitors received a lesson in Empire geography and a free sample of fruit. The Union of South Africa and Southern Rhodesia were showing oranges, grape-fruit and dried fruit. South African citrus fruits are already famous; Southern Rhodesia has increased her export by 150 per cent. in the last 14 years, and now exports 200,000 cases of oranges annually, particularly of the Washington Navel and Valencia Late varieties.

New Zealand displayed honey and apples gathered in what are our spring months, while Australia had apples, dried apricots, prunes, raisins and currants.

Pineapples are the most important fruit produced in Malaya, which now exports 60,000 tons of this fruit (canned) each year to Great Britain, supplying 90 per cent. of her requirements of pineapple. Three different "packs" of the pineapple are marketed—round-cut slice, cubes or "chunks" and crushed or minced pineapple. A cooking demonstration was in progress showing in a practical way how the housewife can use this fruit in making various dishes.

Canada—our most important fruit-growing Dominion—had a big display comprising apples from British Columbia, Nova Scotia and Ontario, and brilliantly coloured Jonathan and McIntosh Red apples were given away as samples of the two most popular apples produced. The total shipment of apples from Canada to Europe is about $4\frac{1}{2}$ million boxes per annum.

Cyprus showed the Mediterranean fruits (oranges and lemons), seeds and spices produced in her island; England and Wales exhibited a large range of home-grown apples,

pears, tomatoes, jams, honey, canned fruits and vegetables; while Northern Ireland and the Irish Free State both exhibited seed potatoes.

Visitors inevitably found themselves amazed by the wonderful home-grown fruits and vegetables—apples, pears, grapes, melons, tomatoes, cucumbers, French beans and mushrooms—displayed on the Distributive Trades Stands. Everything was shown in commercial packages, just as it would arrive in the market. Besides its instructional value, the decorative effect of these packages when artistically arranged was particularly striking.

Close by was the Retail Fruit Stand, where the choicest fruits from the prize exhibits could be purchased at exceptionally low rates, giving the visitors the opportunity of tasting what he had previously only been able to look upon with envy.

From here the visitor entered an avenue in which all sorts of canned fruits stood arranged in rows and pyramids, piles and columns. Many dipped spoons into attractive dishes of chosen fruits or vegetables, to taste their quality, after which they purchased sample parcels of selected preparations to take home.

The avenue of canned fruit led to another avenue having an array of canning machinery from which all gained an idea of the extremely complicated machines used in making and closing the cans and in processing the fruit. Apples were cored and peeled, vegetables sliced by machinery, etc. There were machines for filling and sealing the cans, sterilizers that also cooked the canned fruit, and machines for attaching the labels. All were seen at work, and gave the impression that a canning factory is a glorified kitchen where everything is done by machinery.

Finally, all visitors took a peep at the Palace of Beauty and recorded their votes on the relative merits of the nine beautiful scenes advertising fruit, in the hope of winning a prize. Thus all visitors, no matter what their usual occupation, found something of interest amongst the great range of fruit at the Show. The growers could see the kind of fruit they should grow and the general public could see the best English fruit to buy. To all the Show gave interest, entertainment and information, and that is why its popularity has increased annually with growers, canners, distributors and the general public alike.

MARKETING NOTES

National Mark Eggs.—The total output of the National Mark Egg Packing Stations for the three months July to September, 1932, inclusive, was 87·3 million eggs, of which 70·7 million were packed under the National Mark, compared with 72·0 millions and 55·5 millions, respectively, for the similar period in 1931. The following Table shows the aggregate monthly output of the stations during these periods :—

1931				1932			
Month	Total output of packing stations	Output under the National Mark	Percentage of output under the National Mark	Month	Total output of packing stations	Output under the National Mark	Percentage of output under the National Mark
July	Millions 26·4	Millions 19·8	75	July	Millions 30·9	Millions 24·8	80
August	22·1	17·0	77	August	28·8	23·2	81
Sept.	23·5	18·7	79	Sept.	27·6	22·7	82
Totals for 3 months	72·0	55·5	77	Totals for 3 months	87·3	70·7	81

National Mark Dressed Poultry.—Four further packers have recently been authorized, one being for ducks only.

The National Mark Egg and Dressed Poultry Trade Committee have recently had under consideration certain suggestions for extending the scope of the present poultry scheme. The Committee have favoured the establishment, by some of the National Mark egg-packing stations, of experimental poultry-packing plants where birds can be received for killing, plucking and packing, though not conditioning. It is anticipated that, at the outset, only a small proportion of the poultry handled would be eligible to be packed under the National Mark. A fair proportion of the remainder would, however, be of good gradable quality, and might be marketed as " Graded Poultry " under the station's private brand. Some of the egg-packing stations have shown interest in this proposal, and it seems probable that a number of packing stations will be operating in the near future on the lines suggested.

At the Dairy Show, held at the Royal Agricultural Hall, October 18–21, Class 19 for market packs of table poultry

attracted 19 entries. Of the three prizes offered, the first and second were awarded to authorized packers in the National Mark Scheme. Other authorized packers secured the "Reserve Award," and "Very Highly Commended" and "Commended."

National Mark Fruit.—National Mark packers have again been prominent among the prize-winners at the recent Imperial Fruit Show at Birmingham. In the classes open to home-grown fruit, 38 first, 36 second and 32 third prizes were awarded ; of these, National Mark packers succeeded in gaining 32 first, 23 second and 24 third prizes. They also secured the whole of the awards in two classes in the British Empire Section, as well as the two Empire championships for culinary and dessert apples. No fewer than 21 of the 25 Special Prize Awards open to home-grown fruit were awarded to National Mark packers.

Marketing Demonstrations.—The suggested National Mark schemes for lettuce and for cauliflower and broccoli were demonstrated at the North Kent Agricultural Association's Commercial Horticultural Show, Dartford (November 8-9). The cauliflower and broccoli demonstration was also staged at the Gloucester Root, Fruit and Grain Society's Show (November 9). National Mark apples and pears were displayed at the Northampton County Fruit Show (November 2-3). At the Birmingham Cattle Show (November 26-December 1), proposals for the grading and marking of home-killed mutton and lamb were demonstrated, together with exhibits of National Mark beef and poultry. The demonstration and exhibits will be repeated at the Smithfield Club Show, Islington, December 5-9.

Publicity for National Mark Products.—A National Mark Shopping Week was held in Coventry in the week commencing November 21, the main feature of which was a display of National Mark products staged by the Ministry at National Provincial Bank Buildings, Hertford Street. The display was declared open by the Mayor of Coventry in the presence of a representative gathering presided over by Captain W. F. Strickland, M.P. Samples were on sale, and National Mark films were displayed in the shop. In conjunction with the Corporation Electricity Department, cookery demonstrations were held in the premises each day, at which National Mark flour and other National Mark commodities were used. A shop-window display competition, open to retailers who stock National Mark products, was

arranged, for which the Ministry offered cash prizes. In connexion with an essay-writing competition for senior school children, a special display of the Ministry's films was arranged at a local cinema. Attention was drawn to the Ministry's display and to the Shopping Week generally by means of advertisements in local newspapers.

Reference was made in the November issue of this JOURNAL to the holding of National Mark flour cookery demonstrations by certain gas and electricity supply authorities. The City of Nottingham Gas Department held demonstrations twice daily from October 24–November 5, inclusive, attended by approximately 5,000 persons. Other demonstrations were arranged at Northampton (November 1–10), Leicester (November 21–25), and Kettering (November 23–December 3).

Sugar-Beet : 1932 Crop Data.—The following averages have been compiled from data supplied to the Ministry in respect of beets delivered to the 16 beet sugar factories in England and Wales during the current manufacturing season up to and including the week ended November 12.

Averages for the corresponding week in the previous season (17 factories) are shown for comparison :—

<i>Week ended</i>	<i>Average weight of roots (grammes)</i>		<i>Average sugar content (per cent.)</i>		<i>Average weight of sugar per root (grammes)</i>	
	1932	1931	1932	1931	1932	1931
October 15	494	410	16.0	17.6	79	72
October 22	482	397	16.9	17.8	81	71
October 29	481	393	16.7	17.8	80	70
November 5	472	397	16.7	17.7	79	70
November 12	465	388	16.8	17.5	75	68
Season to date	479	397	16.6	17.7	80	70

The total quantity of beet sugar manufactured during October, 1932, was 1,557,443 cwt., compared with 1,277,661 cwt. for the corresponding month last year.

Sugar-Beet Contracts, 1933.—The ten-year period of State assistance by direct subsidy in respect of sugar and molasses manufactured at British factories from home-grown beet, which was provided for in the British Sugar (Subsidy) Act of 1925, comes to an end on September 30, 1934. The sugar-beet crop of 1933 will, therefore, be the last to be affected by that Act.

The factory groups have issued their contract terms for the 1933 crop in ample time to enable farmers to consider their attitude towards the growing of sugar-beet for the final campaign under existing subsidy arrangements. The Anglo-

Dutch group of factories (Cantley, Kelham, Ely, Ipswich and King's Lynn) took the lead by offering, early in October, the same terms as those forming the basis of their contracts for the 1932 crop. These terms provide that the "whole net proceeds" from the products manufactured at the factories shall be apportioned on the basis of 80 per cent. to the grower and 20 per cent. to the factory, until the grower's share is equivalent to a return of 45s. per ton of beets of 15½ per cent. sugar content, and thereafter on the basis of 50 per cent. to each party. The "whole net proceeds" are to be determined by adding to the gross receipts from manufactured products any unconditional State assistance and then deducting (1) manufacturing and establishment charges, (2) selling expenses (including Excise duty), (3) interest on working capital, and (4) the net increments (mentioned below) paid to growers in respect of a sugar content in the beets in excess of 15½ per cent. No deductions are to be made in respect of depreciation, directors' fees, additions to plant and buildings, dividends or reserves. The grower is guaranteed a minimum price of 35s. per ton of beet of 15½ per cent. sugar content, with variations of 2s. 6d. per ton upward or downward for every difference of 1 per cent. in the sugar content.

The contract for England and Wales negotiated by the Beet Sugar Factories Committee of Great Britain with the National Farmers' Union provides for basic minima of 38s. per ton of beet of 15½ per cent. sugar content in the case of the factories at Bardney, Bury St. Edmunds, Colwick, Felstead, Peterborough, Spalding and Wissington, and of 40s. per ton in the case of the Allscott, Brigg, Kidderminster, Poppleton and Selby factories. Increases or decreases of 2s. 6d. per ton will be made for each 1 per cent. variation in sugar content above or below the standard of 15½ per cent. If the total amount of State assistance afforded to the industry, plus the certified average price of raw sugar during the last quarter of 1933, exceeds the sum of 18s. 6d. per cwt., the basic price per ton will be increased according to the following scale :—

<i>Government assistance plus sugar price</i>	<i>Increase to basic price per ton</i>
Exceeding 18s. 6d. but not exceeding 19s. per cwt.	.. 6d.
Exceeding 19s. but not exceeding 19s. 6d. per cwt.	.. 1s. 0d.

and so on at the same scale.

In the case of the Bury St. Edmunds factory, growers will have the option of this contract or a co-operative contract on the same terms as that offered by the Anglo-Dutch group.

The Working of the Wheat Act, 1932.—On October 26, a broadcast talk on the working of the Wheat Act, 1932, was given by the Right Hon. Earl Peel, G.C.S.I., G.B.E., Chairman of the Wheat Commission. He observed that everybody knows that agriculture in this country is a depressed industry. The world price of wheat is so low that it is hardly possible anywhere in this country to cultivate it at a profit. The acreage of our fields under wheat has shrunk from 2,000,000 in 1922 to 1,300,000 in 1932. It has often been said that agriculture is not one business but many. The Wheat Act attacks one side of the problem, and it is designed to secure a fair price, and no more than a fair price, to the farmer for his wheat. The Act does not interfere with a free market for wheat; a farmer can sell as he likes and where he likes in order to secure the best price.

The Wheat Act is not administered by the Ministry of Agriculture, but by the Wheat Commission. This body does not, like many commissions, examine and report upon a subject; it has to carry into effect the provisions of the Wheat Act. It has offices and staff of its own at Westminster House, Smith Square, London. For some purposes it is under the control of the Minister of Agriculture; in some cases the Minister asks its advice, but, generally speaking, it acts independently. The Commission consists of 17 persons, as well as a chairman and vice-chairman, and is representative of millers, farmers, bakers and consumers. It has been in business since June last. It has had to construct the whole machine for working the Act. It has had to appoint nearly 2,000 merchants who will issue wheat certificates to farmers, and to set up 54 local committees to hear appeals from farmers. It has granted exemption to 1,800 provender millers, who are not liable to make quota payments. It has registered 84,000 wheat growers; it collects the quota payments from about 500 millers and flour importers, and is responsible for distributing the money so collected to the farmers. The costs of administration are estimated to be about one per cent of its income, or less than 3d. per quarter of wheat.

The Act secures to the farmers what is called the standard price of 45s. per quarter of 504 lb. The average price of wheat for the year is deducted from the 45s., and the difference, called the deficiency payment, is payable to the grower for each quarter of wheat sold and delivered. Some farmers have made a mistake at this point. They have thought that the deficiency payment is the difference between the price at which they sell their wheat and 45s. But if a man sells his wheat for 24s., he will not get 21s., but 20s., or whatever the deficiency payment may be; or if he sells his wheat for 30s., he will not receive 15s. per quarter, but again 20s., or the ascertained deficiency payment.

How then does the Commission obtain its income? It levies money from the millers on every sack of flour they sell, and on every sack of imported flour. This money is paid into the Wheat Fund Account in the Bank of England. I must here express our gratitude to the millers for the promptness with which, week after week, they send their cheques to the Commission. At the present moment the payment is 2s. 3d. per sack of 280 lb.* It is not easy to fix the exact amount to be paid per sack. We have to estimate the average market price of British wheat for the year. Clearly we cannot know the exact price

* See p. 853.

until the end of the cereal year. We have also to estimate the supply of flour, that is to say, the number of sacks that will be milled or imported and delivered during the year. We must also form an idea of the supply of wheat during the year. Here we are on surer ground, because at a certain date the Minister of Agriculture fixes a figure which is called the anticipated supply. From these data we must calculate the quota payment to be made per sack. You will see then that members of the Commission must either be mathematicians or prophets. As the year proceeds, we may have to vary the amount of the quota payment. But may I say one word here to the bakers. Please do not believe all the fairy tales which are told you by those who wish to sell you flour. Be assured that the Commission are anxious to make as few changes as possible in the quota payment, and will only increase the payment in case of absolute necessity.

The money then is being collected ; but how does it enter the farmers' pockets ? First of all, every grower of wheat must register : 84,000 are already entered on our lists. England and Scotland are well up to date, but there are a few laggards still in Wales and Ulster. But to the credit of Ulster, understand that the first wheat grower to register with the Commission was a lady resident in Tyrone. Here the merchants can give us much help ; they can impress upon growers that they cannot get their certificates or payments until they have registered.

In order to secure the payment, the grower must sell and deliver his wheat. He must then obtain from an authorized merchant a wheat certificate stating that the wheat was grown on the farm ; that it was sold as stated, and that it was of millable quality. A farmer who has received his wheat certificate must enter on the back his claim for payment, must give his registered number, and post the certificate to the Wheat Commission. He should also keep an account of all his purchases and sales of wheat during the year. May I ask all farmers who have sold wheat to send in their certificates without delay ? We know that over 2,000 farmers have not sent in certificates that have been issued to them ; they are not entitled to a penny in payment until those certificates are delivered to the Commission. In order to save trouble, the farmers might ask their authorized merchant to send in the certificate on their behalf, at the same time as he posts his own. This would save the time of the Commission and reduce expenses.

The payment is made, not on all wheat, but on millable wheat. Millable wheat does not mean, however, only wheat that is sold to a miller. The Minister has defined the term " millable wheat," but has only put into words what is well known to every competent person in the trade. I would urge all farmers to see that their wheat is as clean and free from impurities as possible ; they should remember that before the sale of their wheat they can obtain a permit from the Commission to remove it from the farm in order that it may be cleaned or conditioned. Then the merchant will have no difficulty in certifying that their wheat is millable. One damp bag in a big bulk of wheat can do much damage.

Authorized merchants are persons appointed by the Commission in all parts of the country. Their duty is to issue the wheat certificates ; they act as judges of what wheat is millable and of what is not. If the grower is not satisfied with the decision of one of these gentlemen, he has a right of appeal to the local wheat committee, whose decision is final. On those merchants is laid a very responsible task. I do not doubt that by their impartial decisions they will win the confidence of wheat growers and the public.

May I say this to the farmers ? We are asking them to comply with a few rules in order that wheat certificates may be issued in a proper manner. We hate red tape just as much as they do ; we wish to make

certain that every bushel of wheat that is entitled to the deficiency payment shall *get* the payment; equally that not a single bushel shall get the payment unless it is justly entitled. For this reason an authorized merchant is not permitted to inspect wheat and issue a certificate so long as the wheat remains on the grower's farm. If a farmer desires to repurchase for seed wheat he has sold, the wheat must first remain for three clear days in the merchant's warehouse or in a public warehouse. These conditions are made in the interests of the farmers themselves; they are necessary to make the Act workable.

Now if a grower can get 45s. for his wheat, will not everybody want to grow wheat; and will it not follow that the quota payments may become very heavy? This danger has, of course, been foreseen. The Act does not guarantee the standard price for more than 6,000,000 qr. If, say, 7,000,000 qr. of wheat are grown in any year, the money collected from millers would not increase, but would be distributed over a larger number of quarters; thus each quarter would get a smaller deficiency payment. After a certain point, therefore, the larger number of quarters, the smaller becomes the incentive to grow wheat. This check to cultivation is of value to the consumer. His interests also are not forgotten. Many will say—we wish to assist the farmer and we would like to see more wheat grown in this country, but we do not wish to pay more for our bread. To the consumers I would say—you are now getting the cheapest and the best loaf in the world; the only rival may be Belgium. The world sends its wheat to our mills at very low prices. A pound of wheat costs about three-fifths of a penny. Those low prices have ~~proved~~ the ruin of our splendid wheat lands. By these payments we are giving to the wheat farmers a chance of recovery, but no more than a fair chance. Of course, if the world price rises, the lower will be the quota payment, because the difference between the average price and the standard price will grow less and less. At present the quota payment on a sack of 280 lb. of flour is 2s. 3d.* Two-hundred and eighty pounds of flour will make about 376 lb. of bread. It is hard to see how, throughout the year, such a payment can make an appreciable difference to the price of the loaf. The consumers, therefore, will enjoy the pleasant sensation that they have been generous without danger to their own pockets.

One more word to the farmers. When you sent up your wheat certificates, you applied for a payment on account. The Commission has the right to make a payment in advance; we have decided to exercise this power†; we do not want the farmers to wait until August or September of next year, when we shall know the exact amount of the payments to be made. We hope, therefore, to make an advance on account not later than the end of this year. But again, may I urge those farmers who have sold their wheat to send their certificates to the Commission as soon as they possibly can?

I am happy to say that the Act has been working very smoothly. That is largely due to the splendid assistance and co-operation we have received from all the parties concerned—growers, merchants and millers. They have done their best in every way to make the Act a success. The Act is in the nature of an experiment. When the time comes to review its operations, public opinion will be greatly influenced by the knowledge that all sections of the industry engaged in the growing or marketing of wheat have worked together so loyally for the benefit of agriculture.

* See page opposite.

† See page 794.

Quota Payments under the Wheat Act, 1932.—The Minister of Agriculture and Fisheries has made the Wheat (Quota Payments) No. 2 Order, 1932,* dated October 29, prescribing that the amount of quota payment which every miller and every importer of flour shall be liable to make to the Wheat Commission in respect of each hundredweight of his output, as from October 30, shall be 13·2 pence, i.e., 2s. 9d. per sack of 280 lb.

† This Order supersedes the Wheat (Quota Payments) No. 1 Order, 1932, which was made on June 16 last.

Latvia : State Participation in the Marketing of Live Stock and Meat.—According to a report in the Riga Official Gazette, *Valdības Vestnesis*, of October 4, 1932, regulations have been made providing for the participation of the Latvian Government, through the Latvian Ministry of Agriculture, in a Meat Industry and Export Company which is being established for the preparation of meat products and live stock for the home and export markets. The Government will secure the controlling interest in the company by the use of funds loaned by the State Land Bank to the Co-operative Society "Valmieras Eksports." The company will have the monopoly of exports of live pigs and bacon.

The Wheat Campaign in Italy.†—In 1922, Italian agriculture, which the War had left in a very unsettled state, began to receive a substantial share of the Government's attention, and three years later, after a spirit of co-operation had been fostered within the industry, the Government started its Wheat Campaign.

The controlling body of this campaign is a permanent Wheat Commission whose duties are "to study and submit proposals to the Government regarding the means for increasing the wheat production of the country." The Commission, of which Signor Mussolini is President and the Minister of Agriculture and Forests Vice-President, is representative of farmers, farm-workers and agricultural experts. It is assisted by 92 provincial committees, each representative of local agricultural interests, and it works in collaboration with the Department of Agriculture and the agricultural institutions.

The Commission began its work in July, 1925, and within a few weeks brought out a series of far-reaching proposals that have subsequently formed the basis of legislation. The main objectives were : stabilization of wheat prices, improvement of production technique,

* S.R. & O., 1932, No. 886.

† The substance of this Note is derived from a statement on the Wheat Campaign in Italy issued by the Minister of Agriculture and Forests in Italy (September, 1931), supplemented by later information.

and increased output. The last has been attained by an increase, not in area, but in yield. More recently, a secure market for Italian wheat has been assured by the introduction in June, 1931, of a compulsory milling quota.

The improvement of production technique has proceeded on extensive and up-to-date lines. A fund has been established from which loans are advanced to farmers to enable them to purchase modern equipment. Prizes are offered for mechanical ploughing, sowing and the systematic treatment of the land. Plant breeding institutes have been established for the production of good seed and facilities provided to enable small farmers to obtain it. State action has been taken to ensure that artificial fertilizers will be available at lowest possible prime cost and to secure the reduction of transport charges. In turn, farmers have been required by statute to construct suitable manure stores and to preserve and use the manure according to the rules of good husbandry.

The marketing of grain has been assisted by the establishment in each district of a mechanical grading and screening plant which is available without fee to all farmers in the neighbourhood.

Public and agricultural attention is focused on the campaign by an annual Wheat Victory Competition which, instituted privately in 1923, was later taken over by the Wheat Commission. The prizes are large and in 1925 amounted to 1½ million lire (£11,364 at the rate then current), with an additional 1½ million lire for local competitions. The more important prizes are distributed annually at Rome by the Duce, who uses the occasion to speak on the wheat situation of the day, summarize the year's work and suggest the line to be followed in the coming season.

The success that has attended the campaign may be judged from the fact that, although the acreage under wheat has remained fairly constant, the average yield for the five-year period 1925-26-1929-30 was 12.42 quintals per hectare (9.9 cwt. per acre), while that for the period 1909-14 was 10.4 quintals per hectare (8.28 cwt. per acre). The yield for 1932 was 15.2 (12.11 cwt. per acre), the highest ever recorded in Italy. It is estimated that the imports of wheat for the coming year will not exceed 8 million quintals (15,747,000 cwt.), or about 10 per cent. of the country's requirements.

Italy, in common with other European countries, has suffered from the effects of the general economic depression. Nevertheless, vigorous steps have been taken to maintain the internal wheat price level, and in 1925 a tariff of 7.5 gold lire per quintal (3s. 1d. per cwt. at the then rate) was put on wheat, with equivalent tariffs on other cereals and their derivatives. This tariff has successively been raised and in August, 1931, stood at 75 lire per quintal (8s. 3d. per cwt.). In addition to the maintenance of the price level, measures have been introduced to prevent price fluctuations. Credit facilities were provided in 1925 to enable farmers to construct co-operative warehouses and silos for storage purposes; in 1931, credit institutes were requested to furnish funds for supporting growers at the critical market periods.

The Italian quota scheme was introduced in June, 1931. It was announced in the following December that the system would continue in future years, but that the amount of the quota would be fixed according to the harvest yield. The scheme places on millers an obligation to include fixed minimum percentages (which vary in different districts) of home-grown hard or soft wheats in their grists for the production of flour and semolina. Considerable variation in the prescribed minima has occurred since the scheme began. In July last, they stood at 95 per cent. hard for Sardinia, Southern Italy and Latium and 70 per cent. hard for Central and Northern Italy; and at 95 per cent.

soft for Sardinia, 27 per cent. soft for Sicily and 95 per cent. soft for Central and Northern Italy including Latium.

Penalties for infringements of the quota scheme vary from a fine of £5 to the closing down of the offending mill. Flour milled from foreign grain in excess of quota requirements is confiscated; and prefects are authorized to require warehouses storing foreign grain to be double-locked so as to be opened only in the presence of the police.

The wheat proposals have had a salutary effect on the yield of other cereals. The yields of rye, barley, oats and rice have increased by 20, 20, 17.8 and 42.3 per cent., respectively, in the period 1926-29 as compared with the period 1909-14. In its endeavour to encourage wheat production, the Wheat Commission has from the first been mindful of the value of crop rotation; the programme outlined above is, in fact, part of an extensive scheme to speed up every form of Italian agriculture.

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DECEMBER ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,

Director of Agriculture for West Sussex.

Winter Work.—Short days and wet ground curtail the activities on arable land. The soil is now colder and, except in favoured situations, wheat sowing is suspended until February. Ploughing may still proceed on land that is in preparation for roots, and ploughing of lea ground intended for spring-sown cereals may be continued.

Where a temporary pasture of two, three or more years' duration is ploughed up for spring corn, it is very necessary to get the grass well fed-off with the object of mitigating the troubles that frequently follow a rotation of this character. Such land is apt to harbour insect pests, particularly wireworms and leather-jackets, and, so far as cultivations are concerned, a firm compact seedbed is necessary to minimize the damage. Consolidation is easier when the grass has been closely grazed.

The older the grass land, the earlier it should be ploughed in order that it may be mellowed by exposure to the weather. A spell of frost in mid-winter is always welcome. Frost is an excellent tillage agent and is not surpassed by any implement. A mid-winter frost also provides opportunities for carting over roads and fields on which carting would be impossible in mild weather, or would at least cause much damage.

In contrast with the arable land workers, those engaged in tending stock have a full round of activity. Cattle are now under winter conditions, and where they are housed during winter the labour and food requirements are at the maximum. Early housing is economic, especially with young stock; it

avoids the set-back that occurs in early winter, and ensures the stock carrying through the winter without such liberal feeding as would be required if the animals had lost condition before being brought in.

Farmyard Manure.—It is impossible to estimate the loss entailed annually by the careless treatment of farmyard manure. A loss is incurred even where every care is taken, but this unavoidable loss is added to very materially by negligence. The dung heap is too often a mere dump. Every dung heap should be kept compact, with as little surface as possible exposed to washing or drying through weather conditions. A proper mixture of the manure from different classes of stock is advisable, and the manure from horses, cattle and pigs when mixed together helps to form a manure that will be neither too dry nor too wet. A useful addition to the heap may be road scrapings or any earthy or vegetable refuse; these add bulk to the manure and are thus some asset, and it is a real advantage to have the thoroughfares in and around the steading kept in a tidy and comfortable condition.

Loss is apt to be greatest where cattle are kept in stalls and the manure is moved daily to a heap. A covered heap is an advantage, but, even under such conditions, the manure should be kept compact, and the greater the height of the heap the smaller the loss. The heap should not be allowed to become too dry, and in this connexion the mixing of horse manure with that from cattle usually gives a desirable condition. If litter is used too freely, dry conditions may arise.

Eventually the manure has to be taken to the land and this involves considerable labour and very often takes up time at a period when cultivation work is pressing. For this reason it is important to take every opportunity during winter to move the manure to the field where it is to be used. Every movement of a manure heap provides opportunities for loss. Considerable advantages may be obtained, however, by moving the manure to the field in which it is ultimately to be used, particularly if this is situated some distance from the steading where the manure is made.

The making of a manure heap in the field involves some loss, but this is more than made up by the reduced loss that will arise when the manure is distributed on the land. This loss is not always fully appreciated. Warm, dry, sunny days with drying winds cause the greatest losses. Cool rainy weather

is most suitable, and the sooner the manure is incorporated with the soil the smaller the loss, hence the advantage of having the manure heap in the field.

Where the farmyard manure is made in yards or courts, and particularly where these are covered, the advisability of moving the manure to a heap in the field is more doubtful and the distance between the field and the site where the manure is made must determine whether the removal should be done in winter and before the manure is actually to be applied to the land.

Grass Land.—The ever-increasing area of grass land should not be allowed to look after itself during winter. A good deal can be done now to improve or maintain its condition so as to provide the best possible quality and quantity of produce during the usual growing periods.

In recent years, much more attention has been given to the mechanical treatment of grass land. The chain or bush harrow and the roller have been replaced by more drastic treatment. The first consideration should be to ensure that, at some time during the winter, the whole of the old grass should either be eaten off or trodden. It has been said of the good grassland farmer that he has his land bare at some season of the year. A good deal of manure has been wasted when it was applied to rough grass land with a heavy cover of grass and often a mat of undecayed vegetable matter as well. If stock are not available to eat off the grass, or if it is of too unpalatable a nature to be eaten by stock without actually starving them, then drastic cultivation should be pursued. Repeated disc harrowings followed by frequent harrowing with spiked harrows is certain to produce good results on all second-rate pastures, and the worse the condition of the pasture, the more need is there for drastic action and the greater is the certainty of improvement.

Where horses or tractor are available, they need not be idle in winter where there are pastures crying out for improvement.

Except during frost or very wet weather mechanical treatment of pastures can proceed at any time. There is no need to hesitate about severe harrowing, but the roller must be used with judgment as, on wet heavy land, it may do more harm than good.

In the same way, the tread of the horses or the track of the tractor may cause injury during very wet weather, and some

discretion should be exercised in such circumstances. On light land, consolidation is important, and the lighter the soil the greater will be the benefit from rolling. Repeated rolling with a few weeks' interval is more effective than concentration by repeated rollings at a particular period.

Whilst mechanical treatment is the first procedure, something should be done to prevent the land falling back again into its previous condition. Manuring must be resorted to, and in no way can beneficial economic results be more surely obtained than by the proper manuring of second-rate grass land. The earlier the manures are applied, the better will be the results next summer.

Live Stock.—Where early lamb production is a rule, the ewes will now be heavy in lamb, and the importance of correct treatment at this time cannot be overlooked. The ewes should be brought to lambing in a progressively thriving condition, and the use of a little concentrated food is a practice that can be recommended. Directly lambing has taken place, ewes should be given really liberal treatment, so that a good flow of milk is maintained. The supply of milk during the first few weeks will determine the success of the lamb as an early marketable product. Store sheep, fattening on roots, need not have large quantities of concentrates, but a little hay will allow of better economic use being made of the roots.

Grassland sheep, not due to lamb till about March, can be run along cheaply for another month or even longer where there is a good run and a fair bite of grass. Under lowland conditions, the pastures are apt to get very bare if numbers are at all large, and in such circumstances hay may be given as a cheaper supplement than concentrated foods.

Cattle, wintered outside, will generally require hay and possibly a few roots, but, unless it is intended to prepare them for sale in the early spring months, the use of concentrated foods for strong store stock may not be profitable. On the other hand, young cattle may require a little help in this respect, and in-calf heifers, due to calve in the early spring months, should be liberally treated. Heifers calving as late as May, however, will get enough of the spring grass to ensure coming down with good bags, and the need of much concentrated food during winter is less imperative.

NOTES ON MANURES

H. V. GARNER, M.A., B.Sc.,
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Fertilizers and Crop Quality.—The most obvious effect of manuring is to increase crop yields, and this is frequently the only aspect of the case that is considered. Other ways in which fertilizers may affect the value of a crop are : (1) by increasing the size, as distinct from the total weight of the produce, as when the proportion of ware in the potato crop, or of head corn in cereals, is increased ; (2) by improving the content of the crop in some constituent for which it is primarily grown, such as sugar in the beet crop or starch in barley and potatoes ; (3) by promoting resistance to disease and consequent gain of marketing value ; (4) by increasing resistance to frost damage ; and (5) by rendering delicate market-garden crops less likely to be damaged in transport.

It must not be assumed that fertilizers are uniformly beneficial in these respects. There is a good deal of evidence that the composition of crops may be adversely affected by excessive or ill-balanced dressings. Moreover, climatic and soil conditions are much more potent in deciding questions of quality than fine points of manuring. No scheme of fertilizer treatment will make black-land potatoes the equal of those grown on the red soils. Variety also plays a great part.

As in all work with fertilizers the evidence relating to quality effects is sometimes conflicting. It is never possible in practice to test manures alone, but only in relation to the local soil and climate, so that complex effects are always being studied. If, for example, a soil is abnormally deficient in nitrogen, addition of nitrogenous fertilizers will greatly increase yield and also make an all-round improvement in the character of the produce, whereas on very rich soils nitrogenous manuring may actually harm the quality of the crop. Nevertheless, within these limits manuring plays a part in affecting the nature of the produce, and certain fairly definite relationships emerge.

Nitrogen.—This is the most active of the manures in affecting the composition of crops. It is readily taken up by the plant, and elaborated into proteins and kindred substances. The protein in the plant may be balanced by a corresponding amount of carbohydrate if conditions for growth are good, when the composition of the crop remains normal. If this countervailing growth cannot take place the proportion of

protein in the crop rises, and this influences, beneficially or otherwise, the quality of the produce. Moreover, the soft growth and late maturity associated with nitrogenous manuring has its bearing on the nature of the final product.

Quality changes following the use of nitrogenous manures have been observed in pasture grass and in feeding barley, a beneficial increase in protein content taking place. In the case of crops grown mainly for starch this effect is detrimental, and the lowering of the malting quality of barley and the depression of the sugar content of sugar beet are well-known examples of this. A further effect is observed when nitrogen is used on mixtures of grasses and legumes either in pasture or in the form of forage mixtures. The action is to repress the legume and stimulate the grass, and in pronounced cases the balance of the mixture is so upset as to lead to a lower percentage of protein in the crop. At Woburn a slight injury to the cooking quality of potatoes resulted from the use of nitrogenous fertilizers.

Nitrogen makes for "soft" growth and adversely affects the quality of the fibre of flax, and by causing lodging in cereals leads to serious depreciation of the quality of the grain and straw. Nitrogen also renders the crop more subject to attack by certain fungus diseases.

All the above effects are associated with comparatively heavy applications of quick-acting nitrogenous manures. As a rule they are aggravated by using the nitrogen unsupported by mineral fertilizers and supplying it late in the season—that is to say, when the plant can still take it up, but has restricted opportunity for laying up a compensating store of carbohydrate. Potassic, and to a lesser extent phosphatic, manures have a contrary effect, and tend to redress the undesirable results of too much nitrogen. By employing a complete manure the yield-producing power of nitrogen may be exploited without the risk of some of the changes mentioned above.

Potash comes second to nitrogen in its effect on crop quality, and is associated with increased storage of carbohydrate. The best example is the improvement in sugar content of the beet crop. Similar but much less marked effects are shown in potatoes and in barley when sulphate of potash is used (the presence of chlorides is unfavourable to potatoes). Potassic fertilizers improve the bushel weight of cereals, and although they stiffen the straw this action is not sufficient to prevent lodging if large amounts of nitrogen are given.

In one respect potash and nitrogen work in the same direction : each tends to keep the plant in growth at the end of the season. In other respects their effects are antagonistic. The influence of potassic fertilizers on quality is complicated by the fact that sometimes sulphates and sometimes chlorides are used. Chlorine has injurious effects on the quality of potatoes and tobacco, but slightly beneficial effects on sugar beet and flax. For most market garden and fruit crops the sulphate is preferable.

Phosphates.—In normal circumstances the action of phosphatic manure on quality is slight ; its power of counter-acting the lateness due to the other manures is one of its most valuable properties. When applied to phosphate-deficient pasture, phosphatic manures markedly increase the content of the herbage in phosphoric acid and protein, and a very real improvement in quality takes place.

The extensive literature dealing with fertilizers in relation to crop quality has recently been summarized by B. L. Hartwell for the National Fertilizer Association (U.S.A.).* In addition to the common farm crops of temperate climates, references are made to work on market garden and tropical crops.

Lime on Grass Land.—The bad effects of acidity are not so pronounced on grass land as they are on arable. Grass land that is distinctly acid will still produce a fairly normal crop, the plants that can withstand the sour conditions making the heaviest contribution ; whereas on arable land the failure may be complete if a crop sensitive to acidity is cultivated. There are, however, several well recognized circumstances under which the liming of grass land is essential.

The soil may be so lime-deficient as to present unmistakable symptoms in the vegetation. The herbage will consist of poor coarse grass, generally of a dull green-brown colour. It is poorly grazed. No clover is present and there is an abundance of sorrel, yarrow, and woodrush. The surface of the ground is covered by a thick mat of undecayed vegetation—one of the surest signs of acid conditions—and in patches the ground may be practically bare. This state of affairs has been studied by J. A. Hanley on the soils of the coal measures and millstone grit in Yorkshire.† Similar conditions are found in parts of E. Lancashire, Derbyshire,

* Proceedings of the Eighth Annual Convention, 1932.

† Leeds, Bull. No. 107, 1918.

and Cornwall. On such land basic slag or any other source of phosphoric acid is usually ineffective; only lime will enable the mat to decompose and give the roots of clovers and better herbage access to the soil. The improvement takes several seasons to make itself felt, but when once it sets in it lasts for many years. The herbage takes on a brighter colour, is better grazed and becomes more resistant to drought in summer. The weeds associated with sour land give way.

Phosphates are beneficial in most cases when the initial improvement by lime has set in.

The classical Park Grass Plots at Rothamsted show that periodical liming is necessary to maintain good quality herbage on land continuously receiving sulphate of ammonia. This is clearly a more pronounced example of the effects of certain artificial manures in inducing acidity than would be encountered in ordinary practice. Nevertheless, liming will probably be required on most soils having low reserves of calcium carbonate if the system of management resembles that practised on Park Grass. For example, liming would be required on permanent meadows receiving yearly dressings of artificials including sulphate of ammonia, but little or no dung; and also under the intensive system of pasture management involving heavy applications of artificials including sulphate of ammonia.

One of the valuable functions of lime under meadow conditions is to facilitate the decomposition of organic matter in the surface layers of the soil, while in pasture it leads to keener grazing and tends to maintain the calcium content of the herbage. Thus in a series of manurial trials on grass land recently conducted in various parts of Great Britain the complete manure including chalk increased the yield of dry matter by 45.3 per cent., but the percentage of lime in the herbage was increased by 97.2 per cent., showing that an enrichment in calcium was taking place. In some cases this gain in lime was very marked; thus, on a millstone grit soil the lime in the herbage was raised from 0.40 per cent. to 2.54 per cent.

A special instance of the use of lime on grass land is in its establishment from seed. R. B. Dawson and T. W. Evans* have shown that in order to secure a take of grass seed on very acid soil an application of carbonate of lime is necessary, and for the initial establishment quite a small dressing of 1 ton per acre was effective. In sowing down grass on land that is

* This JOURNAL, Vol. 37, 1931, p. 1188.

only slightly acid this treatment is a safeguard, particularly in relation to the clovers.

On ordinary soils the use of lime on grass land is less necessary. In fact, where phosphates will produce a marked improvement liming is usually not required. Good examples of this were found by A. W. Ling and T. Wallace* working on distinctly acid grass land in the West Country. In general, phosphate produced a rapid change in the herbage. For the first three years lime had little effect, although benefit was observed in the subsequent years. This delayed action of lime and its persistent effect have been noted by other workers. On one of the Woburn fields that received two tons of quicklime, the benefit was readily visible after a period of at least 15 years.

Quicklime should be applied to grass land during the winter when the grass is short and dry, for it then has the best opportunity to reach the soil. If the surface is badly matted heavy harrowing assists its action. Carbonate of lime is quiet suitable, but the fact that double the dressing per acre must be used frequently makes quicklime more convenient, and in many cases cheaper also. There is no risk of burning the herbage with carbonate even in heavy dressings, and it may be applied at any time. No general scale of dressings can be laid down, but local advice in this matter may be obtained from the County Agricultural Organizer.†

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**Jour. Bath and West*, sixth series, Vol. II, 1927-28, p. 109.

† See also the Ministry's Bulletin No. 35, *The Use of Lime in Agriculture*, obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2. Price 6s. (post free 7d.).

PRICES OF ARTIFICIAL MANURES

Average price per ton during week
ended November 16.

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	8 10d	8 10d	8 10d	8 10d	11 0
" " Granulated (N. 16%) ..	8 10d	8 10d	8 10d	8 10d	10 7
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	5 5d	5 5d	5 5d	5 5d	5 1
Calcium cyanamide (N. 20·6%)	6 17e	6 17e	6 17e	6 17e	6 8
Kainit (Pot. 14%) ..	3 8	3 3	3 0	3 5g	4 8
Potash salts (Pot. 30%) ..	5 9	5 6	5 3	5 7g	3 7
" (Pot. 20%) ..	3 18	3 14	3 11	3 16g	3 10
Muriate of potash (Pot. 50%) ..	10 2	9 15	9 8	9 18g	4 0
Sulphate " (Pot. 48%) ..	11 17	11 12	11 7	11 16g	4 11
Basic slag (P.A. 15½%)||	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)||	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26·27½%)||	2 10a	2 8a	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%)	3 2	..	3 4	2 16k	3 6
" (S.P.A. 13½%)	2 17	2 9	3 0	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	6 10	6 5	7 5	6 7	..
Steamed bone-flour (N. ½%, P.A. 27½-29½%) ..	5 15	5 2	5 10	5 5	..

Abbreviations : N. = Nitrogen ; P.A. = Phosphoric Acid ; S.P.A. = Soluble Phosphoric Acid ; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

‡ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2s. 6d. extra.

e Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra and for lots of 10 cwt. and under 1 ton 15s. extra.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

k Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

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NOTES ON FEEDING

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Pig Commission Report: Cost of Feeding.—The Reorganization Commission for Pigs and Pig Products has recommended a basic contract price for bacon pigs, the price to vary according to feed costs. The suggested formula has two parts. The *constant* part includes: (a) the cost of the weaner and (b) overheads from weaning to slaughter, made up as follows:—

(a) Weaner.

Food cost	..	..	..	15s.
Overheads	..	..	..	10s.

(b) Overheads.

Weaning to slaughter	..	..	10s.
Total	..	..	35s.

i.e., 5s. per score on a seven-score carcass.

The *variable* part of the formula is based upon the assumption that 6 cwt. of food is required to feed a bacon pig from the weaner stage, when it weighs 25 lb., until fit for slaughter at 185–190 lb. live weight, when it should yield a seven-score carcass. With food stuffs at 7s. 6d. per cwt. the basic price per seven-score pig would be 35s. plus $6 \times 7s. 6d. = 80s.$, or 11s. 5d. per score. On this basis the feeder's costs can be calculated by taking six-sevenths of a shilling per score dead weight for every 1s. per cwt. in the cost of the ration. Thus the use of the formula with any given price of food stuffs results in a different price per score for pigs of different weights. It is not claimed that the formula gives absolute accuracy, but it should be sufficient for a working basis.

It is not intended here to go into the figures that have been used in order to arrive at 25s. as the cost of the weaner; the important point to note is that it is based upon an assumption of eight pigs weaned per litter. It seems to be generally agreed that 25s. represents a fair price for a weaner of 25 lb. live weight. The quantity of food—6 cwt. taken as sufficient to feed a pig from the weaner stage when it weighs 25 lb. until it reaches 185–190 lb. live weight, or seven-scores dead weight—works out at 4.2 lb. of food per 1 lb. live-weight increase. The report states quite definitely that it is not claimed that 6 cwt. of food per bacon pig, or 4.2 lb. per 1 lb. live-weight increase, is an average for this country. We know,

however, both from experiments and from records obtained from commercial practice, alike in this country and abroad, that it is quite possible to secure 1 lb. live-weight increase from 4 lb. of food or less, but to do so means that there must be efficiency in methods of production. The second interim report of the Pig Industry Council,* in its summary of the weaknesses of the industry in England and Wales, noted as one, "inadequate technique in feeding and management." Where there is inadequate technique, there would not appear to be much chance of producing a seven-score pig on the quantity of food mentioned above.

Time and again the writer has heard it stated by farmers that they have fattened pigs successfully on barley meal and sharps, or barley meal alone, without the addition of supplementary foods, and that they were no believers in modern scientifically balanced rations. That they have fattened pigs on these rations cannot be disputed, but the real point is how much food was required in the process to put on 1 lb. of live-weight increase; weighings indicate that it is more often than not about 5 to 6 lb. Talking or writing about quantities in lb. may not impress the sceptic; the difference between 4 lb. and 6 lb. may not appear to be much, but it should not be overlooked that the ratio is the same when stated in tons.

Recent Harper Adams experiments showed that rations consisting of cereals plus fish meal; cereals plus bean meal and minerals; cereals plus soya meal and minerals; cereals plus ground-nut meal and minerals; and cereals plus mixed soya bean, ground-nut, and minerals, all produced 1 lb. of live-weight increase on less than 4.2 lb. of food, whereas when the ration consisted of cereals plus minerals only, 5.12 lb. of food were required. Rations of the same type as the five mentioned above all appear to be reasonably well balanced for the needs of the bacon pig. It should, however, be borne in mind in regard to experiments of this sort that the general conditions as regards attention are usually superior to those on ordinary farms, while the pigs in the Harper Adams experiments were suitably-bred Large Whites. The figures given in Bulletin No. 32 (*Pig Keeping*) for the amount of food required by a seven-score pig from weaning to slaughter is 764 lb. as against the 672 lb. in the Commission's calculation. The more generous figure may be taken as representing something nearer the quantity required under average English conditions, while the Commission's figure should be regarded as that to be aimed

* Marketing Leaflet No. 16.

at, where a standard ration is employed with reasonable efficiency.

For successful results in feeding bacon pigs, not only are balanced rations and suitably-bred stock required, but the skill of the individual in charge is of fundamental importance—without it, no matter how well planned a pig-feeding scheme may be, it is bound to come to grief sooner or later. Systematic recording, as well as general observation, has shown that the best of British practice in feeding and management is quite as good as that in progressive competing countries, but the general level is not so high. Not only are unbalanced rations frequently used in England, but we find lack of efficiency in regard to what might be described as quite elementary matters of management. For example, it is by no means uncommon to find that, where wet feeding is practised, no attempt is made to adjust the amount of liquid to the pig's needs. The average quantity employed should be round about 3 lb. liquid to 1 lb. meal, but the really good pigman makes the necessary adjustments in relation to changing conditions almost as if by instinct. Generally, however, too much water is used. Again, the amount of food is not always regulated to just what the pigs will readily clear up, licking their troughs clean. Pigs given more than they will clear up suffer from indigestion and other troubles, with the result that progress is delayed, and perhaps the quality of the carcass is impaired. A first-class carcass is not likely to be obtained, and there is likely to be waste of a proportionate number of maintenance rations, when the pig has to pass through a store period instead of being fed steadily from weaning to slaughter.

The relationship of housing to economy in food consumption requires to be more closely studied in this country. Abroad it has been demonstrated that first-class housing, as compared with less comfortable conditions, has brought about a saving of 15 per cent. in the amount of food consumed to obtain a certain live-weight increase. It is recognized that it can hardly be expected that much fresh capital should be forthcoming for investment in pig housing at the present time, but much could be done by intelligent adaptation, and by realizing that the housing of pigs is just as important as the housing of cows. In the Eastern Counties and other areas where much straw is grown and is available for bedding, pigs will, no doubt, continue to be housed very largely in yards, amply bedded with straw. In the grassland, cheese-making areas, however, where pigs are fed on whey, it is seldom that straw is at hand for bedding in any

quantity, and under those conditions suitable housing will play a very important part in food economy.

The provision of a basic contract price for bacon pigs based on food costs is a fundamental step towards reorganization, but, in addition, the industry has been called upon to help itself. Considered judgment is that the technique of feeding and management is not all that it ought to be, and since the knowledge of feeding exists, it remains with the less progressive feeders to utilize that knowledge in such a way as to feed as economically as possible. The possibilities of performance-records deserve the attention of breeders who have been content to regard show awards as the principal or only measure of the merit of pedigree breeding stock, and, finally, one might appeal for fuller recognition of the importance of those methods of housing and management that have been carefully studied and are now generally practised by the most efficient of our overseas competitors.

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DESCRIPTION	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	5 12	0 9	5 3	72	1 5	0.76	9.6
Barley, British feeding ..	5 10	0 7	5 3	71	1 5	0.76	6.2
" Canadian No. 3 Western ..	6 3	0 7	5 16	71	1 8	0.80	6.2
" Danubian	5 10½	0 7	5 3	71	1 5	0.76	6.2
" Persian	5 18*	0 7	5 11	71	1 7	0.85	6.2
" Russian	5 18	0 7	5 11	71	1 7	0.85	6.2
Oats, English white	6 7	0 7	6 0	60	2 0	1.07	7.6
" black and grey	6 0	0 7	5 13	60	1 11	1.03	7.6
" Scotch white	7 10	0 7	7 3	60	2 5	1.29	7.6
" Canadian No. 2 Western ..	7 5	0 7	6 18	60	2 4	1.25	7.6
" No. 3	6 10½	0 7	6 3	60	2 1	1.12	7.6
" feed	4 17	0 7	4 10	60	1 6	0.80	7.6
" Argentine	6 8	0 7	6 1	60	2 0	1.07	7.6
Maize, Argentine	4 18	0 7	4 11	78	1 2	0.62	7.6
Beans, English winter	5 15½	0 17	4 18	66	1 6	0.80	19.7
Peas, English blue	15 10½	0 14	14 16	69	4 3	2.28	18.1
" Indian	9 0†	0 14	8 6	69	2 5	1.29	18.1
" Japanese	32 15†	0 14	32 1	69	9 3	4.96	18.1
Dari Egyptian	8 15†	0 8	8 7	74	2 3	1.20	7.2
Milling offals—							
Bran, British	5 17	0 18	4 19	43	2 4	1.25	9.9
" broad	6 15	0 18	5 17	43	2 9	1.47	10
Middlings, fine imported ..	6 7	0 12	5 15	69	1 8	0.89	12.1
" coarse British	6 7	0 12	5 15	56	2 1	1.12	10.7
Pollards, imported	5 15	0 17	4 18	62	1 7	0.85	11
Meal, barley	7 12	0 7	7 5	71	2 1	1.12	6.2
" barley, grade II	6 17	0 7	6 10	71	1 10	0.98	6.2
" maize	5 15	0 7	5 8	78	1 5	0.76	7.6
" " South African	5 7	0 7	5 0	78	1 3	0.67	7.6
" " germ	6 2	0 11	5 11	79	1 5	0.76	8.5
" locust bean	6 5	0 6	5 19	71	1 8	0.89	3.6
" bean	8 0	0 17	7 3	66	2 2	1.16	19.7
" fish	14 10	2 9	12 1	59	4 1	2.19	53
Maize, cooked flaked	6 12	0 7	6 5	84	1 6	0.80	9.2
" gluten feed	6 5	0 12	5 13	76	1 6	0.80	19.2
Linseed cake, English, 12% oil ..	8 7	1 0	7 7	74	2 0	1.07	24.6
" " " 9% "	8 2	1 0	7 2	74	1 11	1.03	24.6
" " " 8% "	7 17	1 0	6 17	74	1 10	0.98	24.6
Soya bean cake, 5½% oil	8 7*	1 8	6 19	69	2 0	1.07	36.9
Cottonseed cake—							
English, 4½% oil	5 5	1 1	4 4	42	2 0	1.07	17.3
Egyptian, 4½% oil	5 0	1 1	3 19	42	1 11	1.03	17.3
Decorticated cottonseed cake, 7% oil	8 5*	1 9	6 16	68	2 0	1.07	34.6
Decorticated ground nut cake, 6.7% oil	8 2	1 7	6 15	73	1 10	0.98	41.3
Palm-kernel cake, 4½–5½% oil ..	6 7½	0 12	5 15	73	1 7	0.85	16.9
" " meal, 4½% oil	6 17½	0 12	6 5	73	1 9	0.94	16.9
" " meal, 1–2% oil	5 17	0 12	5 5	71	1 6	0.80	16.5
Feeding treacle	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale	6 0	0 12	5 8	48	2 3	1.20	12.5
" " " porter	5 10	0 12	4 18	48	2 1	1.12	12.5
Malt culms	7 10†	1 0	6 10	43	3 0	1.61	16

* At Bristol. † At Liverpool. § At Hull.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of October, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 20s. per ton as shown above, the food value per ton is £9. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 6d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.20d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 1d.; P, 0s. 3s. 6d.; K, 0s. 2s. 7d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	5 17
Maize	78	7.6	4 18
Decorticated ground-nut cake ..	73	41.3	8 2
„ cotton cake	68	34.7	8 5

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.39 shillings, and per unit protein equivalent, 1.98 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The “food values,” which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1932, issue of the Ministry's JOURNAL, p. 781.)

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	5 19
Oats	60	7.6	4 18
Barley	71	6.2	5 11
Potatoes	18	0.8	1 7
Swedes	7	0.7	0 11
Mangolds	7	0.4	0 11
Beans	66	19.7	6 11
Good meadow hay	37	4.6	3 1
Good oat straw	20	0.9	1 10
Good clover hay	38	7.0	3 7
Vetch and oat silage	13	1.6	1 1
Barley straw	23	0.7	1 13
Wheat straw	13	0.1	0 18
Bean straw	23	1.7	1 15

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 6d. net.

* * * * *

MISCELLANEOUS NOTES

THE Rothamsted Experimental Station is perhaps the best known agricultural research institution in the world, and the issue of its Annual Report* is

**Rothamsted
Annual Report,
1931** anticipated with interest by many who are concerned in the development of agricultural science. The latest Report summarizing the results obtained during

1931 indicates the stage reached in the investigation of three problems that are of marked importance to agriculture, viz. : (i) the most efficient use of artificial fertilizers on grass and arable land ; (ii) the provision of keep for animals when farm supplies fall short ; and (iii) the maintenance of soil fertility in regions where mechanization is advancing and live stock is being reduced.

So far as the manuring of grass land is concerned it was found that nitrogenous manuring increased the growth of grass, but depressed the growth of clover. On the other hand the increase in the proportion of clover in the herbage resulting from phosphatic manure adds greatly to the protein content. Phosphates are not, however, uniformly available as plant food, and the Report contains information on this point dealing with a variety of soils and weather conditions.

The work on the provision of keep for animals has been carried out mainly in connexion with fodder mixtures and with lucerne. Mixtures of leguminous and cereal crops have been grown and were either cut green and converted into hay or silage or allowed to ripen for use as straw and crushed grain. The advantages of these mixed crops are their cheapness and ease of cultivation, in addition to which they have a beneficial effect in keeping down weeds.

Such fodder-mixture crops, however, must be manured differently from a single crop because there is an element of competition among the plants which form the mixture. Crops grown without manure or with potash or phosphate only are rich in protein and have a high starch equivalent, thus making excellent feeds. If treated with nitrogenous manures, however, the growth of the cereal component is increased, and that of the vetches and peas reduced. As a result the total produce per acre is larger, but the feeding value of the crop harvested is entirely changed. There is no increased protein,

* *Rothamsted Experimental Station Annual Report, 1931.* Pp. 199. Obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, Herts. Price 2s. 6d.

but increased starch equivalent, and the fodder resembles hay of a moderate quality.

Readers of this JOURNAL are familiar with the fact that legume inoculation has been successfully introduced into farming practice, and we now learn that research is being continued in order to discover new strains of organisms that may be even more efficient in their performance.

The increasing use of machinery is leading in the direction of a reduction of live stock on mechanized farms with a consequent diminution in the production of organic manure. The problem of maintaining soil fertility on such farms thus arises. Investigations into four aspects of this problem are being carried out at the station, and the results obtained are described in the report. The lines of research to this end are : (i) Can fertility be sufficiently maintained by artificial fertilizers or is it necessary to return the straw to the land in the form of manure, and if the straw must be returned what is the best method ? (ii) Is it possible to produce, by any cultural process, the same good effects on light land as are obtained by sheep folding ? (iii) Effects of green manuring. (iv) Effects of fallowing.

Laboratory investigations, although highly technical in character, are an essential part of the Rothamsted programme ; they provide the scientific knowledge on which improvements in agricultural methods must be based. Additional rapid methods of testing and classifying soil have been introduced, one of which—the “ Pachimeter ” test—is also likely to be of use outside the sphere of soil investigations.

The results of researches on the micro-biological activities in soil have been applied with success to the problem of purifying the effluent from sugar-beet factories. Progress has been made in the very difficult problem of virus diseases in plants. The virus has been shown not to travel in the transpiration or water stream ; and its entry into a cell is accompanied by marked increase in the respiration rate. New types of insecticides have been investigated, notably Pyrethrin. The Pyrethrum plant can be successfully grown in this country and excellent samples have been obtained on poor sandy soil.

The Report contains abstracts of the more important scientific papers published during the year by members of the Station's staff, as well as a list of technical articles of a practical type. It is not perhaps too much to say that it is of interest to, and should be obtained by, all who are interested in problems of plant nutrition and plant diseases.

NUMBER and declared value of animals, living, for breeding, exported from Great Britain and Northern Ireland in the three months ended September, 1932, compared with the corresponding period of 1931. (From returns supplied by H.M. Customs and Excise.)

Country to which exported	July to Sept., 1932		July to Sept., 1931	
	Number	Declared value	Number	Declared value
CATTLE		£		£
Argentina .. .	3	1,400	35	3,590
Belgium .. .	3	153	7	315
Brazil .. .	—	—	6	365
Russia .. .	238	9,054	453	21,450
Uruguay .. .	1	400	—	—
Australia .. .	2	100	—	—
Canada .. .	7	400	—	—
Irish Free State .. .	5	73	237	4,580
Kenya .. .	10	648	—	—
Union of South Africa .. .	12	1,090	15	1,020
Other countries .. .	3	55	7	172
Total .. .	284	13,373	760	31,492
SHEEP AND LAMBS				
Argentina .. .	1	20	24	650
Belgium .. .	5	31	16	54
Brazil .. .	—	—	6	410
Denmark .. .	6	60	—	—
France .. .	1	15	5	153
Iceland .. .	25	250	—	—
Norway .. .	27	118	—	—
Paraguay .. .	31	465	—	—
Australia .. .	4	150	6	70
Irish Free State .. .	—	—	82	365
Other countries .. .	5	100	4	150
Total .. .	105	1,209	143	1,852
SWINE				
Brazil .. .	3	55	—	—
France .. .	—	—	3	90
Italy .. .	—	—	6	150
Japan .. .	—	—	10	608
Poland .. .	11	105	106	2,170
Portugal .. .	—	—	4	80
Irish Free State .. .	—	—	13	344
Jamaica & Dependencies .. .	3	60	—	—
Kenya .. .	2	65	—	—
Other countries .. .	—	—	12	80
Total .. .	19	285	154	3,517

THE following table, which has been prepared from a statement issued by the Department of Agriculture for Scotland, shows the acreages of potatoes grown in Scotland in 1932 with corresponding acreages in 1931.

**Potato
Acreages in
Scotland, 1932**

	1932	1931
	<i>Acres</i>	<i>Acres</i>
Total acreage grown	146,000	128,000
Total first earlies	14,673	12,532
Total second earlies	15,104	13,323
Total main crops	101,885	85,394
Area unclassified	14,338	16,751

Acreage figures for the most important varieties only are as under :—

	1932	1931
	<i>Acres</i>	<i>Acres</i>
FIRST EARLIES :—		
Epicuro	8,683	7,218
Duke of York, etc.	1,484	1,539
Sharpe's Express	1,931	1,605
Eclipse, etc.	1,531	1,265
Ninetyfold	268	215

SECOND EARLIES :—		
Great Scot	9,048	7,816
British Queen, etc.	3,800	3,781
Ally	390	250
Arran Comrade	294	280
Royal Kidney, etc.	491	370

MAIN CROPS :—

Immune :—

Kerr's Pink	62,103	45,766
Golden Wonder, etc.	9,369	9,374
Majestic	8,494	6,732
Arran Banner	1,174	769
Arran Consul	875	656

Non-immune :—

King Edward, etc.	12,261	14,987
Arran Chief	2,212	2,296
Up-to-date, etc.	1,087	1,087
Field Marshal	466	450

The total acreage of potatoes planted in Scotland in 1932 showed an increase over 1931 of about 18,000 acres or 14 per cent., and was approximately 23,000 acres larger than the 1930 acreage. First and second early varieties both showed increased acreages, the former being about 2,100 acres or 17 per cent. greater, with all the chief varieties, except Duke of York, sharing the increase. Second early varieties were greater by nearly 1,800 acres or 13 per cent., and the most noticeable feature was the alteration in Great Scot which,

with fully 9,000 acres, recovered most of the decline of 2,243 acres recorded last year. The increase in main crop was again due to larger acreages of immune varieties such as Kerr's Pink, Majestic and Arran Banner, the first named advancing over 16,000 acres or 35 per cent. and Majestic 1,762 acres or 26 per cent. Non-immune, as a whole, again declined, but the fall was due entirely to King Edward and Arran Chief varieties, the former being 2,726 acres and the latter 84 acres less than in 1931. The net total increase in main crop was 16,500 acres or nearly 20 per cent.

An estimate of the yield of potatoes in Scotland for 1932 is not yet available, but for comparative purposes it may be noted that the preliminary estimate of the average yield per acre in England and Wales in 1932 was 6.3 tons, or .8 tons above that of 1931.

* * * * *

Cattle Judging.—A record entry was received for the Young Farmers' Clubs annual dairy cow judging contest held at the Dairy Show on Wednesday and Thursday, October 19–20, when 25 teams of three, including boys or girls, drawn from all parts of the country, met in contest for possession during the ensuing year of the Farmer and Stockbreeder Silver Challenge Cup, and for the silver and bronze medals offered by the British Dairy Farmers' Association. Last year there were fifteen teams in competition, as against nine in 1930, and six in 1929. These figures bear eloquent testimony to the increasing popularity of this form of competition.

Teams were divided into four rings for the preliminary contests, two rings operating simultaneously during the morning session on the Wednesday, and the other two in the afternoon. The cattle judged in these eliminating trials were of the Dairy Shorthorn, Ayrshire and Jersey breeds, four animals in each ring. The teams and order of placing were as follows (maximum points obtainable, 720):—

Ring 1 (a.m.)			Ring 2 (a.m.)		
Team		Points	Team		Points
1st Northumberland "B"		535	1st Northumberland "A"		530
2nd Staindrop ..	..	521	2nd Stockton ..	..	500
3rd Berkshire "A"	..	475	3rd Ripon ..	..	490
4th Heighington ..	..	469	4th Buckingham "A"		455
5th Thirsk ..	..	457	Northallerton		
6th Devon ..	..	432	6th Berkshire "B"		425

<i>Ring 1 (p.m.)</i>			<i>Ring 2 (p.m.)</i>		
	<i>Team</i>	<i>Points</i>		<i>Team</i>	<i>Points</i>
1st	Chew Valley	588	1st	Buckingham "B"	568
2nd	Horsham "B"	532	2nd	Deene	515
3rd	Kingsclere	508	3rd	Horsham "A"	491
4th	Cuckfield	492	4th	Steyning	478
5th	Warwick	458	5th	Collingham	406
6th	Swavesey	431	6th	Wroughton	370
7th	Chiddingfold	342			

The first two teams in each of these rings, together with six individual competitors from any other team whose performances were particularly meritorious, competed in the final event on the Thursday when the cattle judged were Dairy Shorthorns, Friesians and Guernseys. This contest proved very close, the Northumberland "A" team winning by a margin of 14 points from Stockton, who were 38 points ahead of the Northumberland "B" team. The detailed result was as follows :—

<i>Teams</i>		<i>Points</i>
		<i>(Maximum 900)</i>
1st	Northumberland "A"	702
2nd	Stockton	688
3rd	Northumberland "B"	650
4th	Staindrop	636
5th	Buckingham "B"	632
6th	Chew Valley	581
7th	Horsham "B"	545
8th	Deene	539

<i>Highest individual competitors</i>		<i>Points</i>
		<i>(Maximum 300)</i>
1st	Angus Thompson (Stockton) (Silver Medal of B.D.F.A.)	260
2nd	Irene Peart (Northumberland "A") (Bronze Medal of B.D.F.A.)	250
3rd	John Thompson (Stockton) (Bronze Medal of B.D.F.A.)	244
4th	James Moore (Northumberland "B")	242

The Challenge Cup and medals were presented to the successful team and competitors by the President of the British Dairy Farmers' Association, Mr. John Evens, who, in congratulating the teams on their performance, spoke highly of the importance and value of the work carried out all over the country by and through Young Farmers' Clubs.

The judges, Professor J. A. S. Watson, Mr. Jesse Crumpler, Mr. W. Burkitt and Mr. W. B. Thompson, explained to the competitors and the spectators during the two days of the contest the reasons for their placing of the cattle judged.

The large number of teams competing placed a considerable strain on the resources of the British Dairy Farmers' Association, but it can safely be said that the arrangements for the

competition were wholly admirable from the point of view both of competitors and the many spectators who closely followed the proceedings. An innovation adopted for the final event was a microphone and loudspeakers, and there is no doubt that these contributed very largely in attracting and maintaining the interest of large numbers of people.

Poultry Judging—The second annual poultry judging competition for Young Farmers' Clubs was held at the Dairy Show on October 21, and attracted an entry of eight teams, the same number as competed last year. A Silver Challenge Cup for annual competition was presented this year by Dr. Bernard E. G. Bailey, of Midhurst, Sussex. The stock judged consisted of three rings, each of four birds, of the Rhode Island Red, White Leghorn and Light Sussex breeds.

The Shipley team, which was placed first in the competition in 1931, won the Challenge Cup by a margin of 39 points over the Sutton Valence team, the complete result being as follows:—

<i>Teams</i>						<i>Points</i>
						(Maximum 900)
1st	Shipley	..	..	..	..	751
2nd	Sutton Valence	..	..	..	..	712
3rd	Herstmonceux	..	..	..	..	590
4th	Hextable	..	..	..	..	587
5th	Sundridge	..	..	..	..	549
6th	Brasted	..	..	..	..	537
7th	Barming	..	..	..	..	514
8th	Trumpington	..	..	..	..	485
<i>Highest individual competitors</i>						<i>Points</i>
						(Maximum 300)
1st	Fred Schroeder (Sutton Valence)	..	..	..	..	265
2nd	Irene Manvell (Shipley)	..	..	..	..	262
3rd	Douglas Langley (Sutton Valence)	..	..	..	..	257
4th	Chas. Scutt (Shipley)	..	..	..	..	251

The Cup and medals were presented at the close of the contest by Dr. Bailey, who paid tribute to the valuable work being done by the Young Farmers' Club movement amongst boys and girls in rural districts.

Miss N. B. Maddison and Mr. Tennyson Fawkes acted as judges.

* * * * *

SEASONAL increases were noticeable in October in the prices of eggs, butter, milk and pork pigs, while grain, especially barley, was cheaper. A further depreciation

The Agricultural Index Number

occurred in values of live stock and it was the fall in this group which contributed most heavily to the decline of 4 points in the general index, so that the level of agricultural

produce in October was only equal to that in the pre-war years 1911-13. This is the first occasion since the early part of 1914 that the index has fallen to 100.

Monthly index numbers of prices of Agricultural Produce. (Corresponding months of 1911-13=100.)

Month	1927	1928	1929	1930	1931	1932
January	149	145	145	148	130	122
February	145	143	144	144	126	117
March	143	145	143	139	123	113
April	143	151	146	137	123	117
May	142	154	144	134	122	115
June	141	153	140	131	123	111
July	142	145	141	134	121	106
August..	142	144	152	135	121	105
September	143	144	152	142	120	104
October	140	139	142	129	113	100
November	137	141	144	129	112	—
December	138	140	143	126	117	—

Grain.—In October, wheat was 1*d.* cheaper at 5*s.* 7*d.* per cwt. and the index fell by one point to 75, while oats were reduced by 3*d.* to 6*s.* 3*d.* per cwt. and were 6 points lower at 90. The usual seasonal decline occurred in the quotations for barley, which averaged 6*d.* less at 8*s.* 1*d.* per cwt., and the index moved downwards by 8 points to 95, as compared with an index of 108 a year ago.

Live Stock.—Except for pork pigs, all descriptions of fat stock realized lower prices in October. Fat cattle made about 3*s.* 3*d.* per cwt. less money and the index was 10 points lower, at only 2 per cent. above pre-war, while fat sheep, at an average of 6*d.* per lb., were $\frac{1}{2}$ *d.* cheaper at 17 per cent. below. In October, 1931, sheep averaged 28 per cent. above pre-war. A reduction of 2*d.* per score in the price of bacon pigs was accompanied by a fall of 2 points in the index to 82, but a slight rise in the case of pork pigs caused an advance of one point to 88. The usual seasonal rise was noticeable in the quotations for dairy cows, which were about 30*s.* per head dearer: the index at 118 was 6 points higher than in September, but 4 points lower than a year earlier. Store pigs also were slightly dearer. Values for store cattle and sheep, however, continued in a downward direction, the former falling 9 points to 100 and the latter 8 points to 72.

Dairy and Poultry Produce.—This October there was a considerable rise in the price of milk, both as compared with the previous month and with October, 1931, owing to the higher level of prices obtained under the recent settlement for 1932-33. The index for October was 145 against only 119 a year ago. Butter and cheese were a little dearer, but while the former

rose one point to 95, cheese declined two points to 114. A seasonal appreciation of 2*d.* per dozen was recorded in the average for eggs, but this was proportionately smaller than that which occurred in the base years 1911-13, and the index fell 3 points on the month to 121. Quotations for dead poultry were little changed.

Other Commodities.—A rise of 2*s.* 6*d.* per ton in the average for potatoes caused the index to advance 6 points to 120, whereas a year ago, owing to the small crop of 1931, the index for October was 210. Hay and wool were unchanged in price, but the index for the former was 2 points lower on account of a rise in price in the years 1911-13. Vegetables generally were dearer than in September, the index being 137 as compared with 113 a month earlier.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13=100.)

Commodity	1930	1931	1932			
	Oct.	Oct.	July	Aug.	Sept.	Oct.
Wheat	93	76	79	80	76	75
Barley	113	108	94	90	103	95
Oats	88	89	101	106	96	90
Fat cattle	131	118	117	118	112	102
„ sheep	162	128	97	90	86	83
Bacon pigs	125	88	87	86	84	82
Pork „	145	103	86	87	87	88
Dairy cows	130	122	112	110	112	118
Store cattle	127	118	113	113	109	100
„ sheep	162	118	90	81	80	72
„ pigs	207	131	84	86	86	89
Eggs	156	129	114	115	124	121
Poultry	139	130	119	117	124	126
Milk	147	119	143	148	150	145
Butter	114	105	104	100	94	95
Cheese	117	108	131	125	116	114
Potatoes	140	210	134	106	114	120
Hay	96	81	66	68	69	67
Wool	88	76	58	61	62	62

THE Ministry's Annual Report on the prices and supplies of agricultural produce and requirements, relating to the year 1931-32,* was published on November 9. The report summarizes the changes that have occurred in the agricultural situation both at home and abroad since 1920, and traces the relation between the price level of the various groups of agricultural

**Agricultural
Statistics, 1931
(Part II)**

produce and the level of commodities as a whole. The severe decline of the last few years is analysed, with particular reference to the livestock group, which has recently shown a marked deterioration from its comparatively good position as compared with other branches of farming. All the more important commodities are reviewed separately from the point of view of price, imports and total supplies, and the usual statistical tables are appended showing average prices and imports in 1931 of a large number of agricultural products with, in many cases, comparative figures for earlier years.

Copies of the Report, which forms Part II of the Agricultural Statistics, 1931, may be purchased through any bookseller or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2, price 1s. 3d. net or 1s. 5d. post free.

* * * * *

THE Minister of Agriculture, Major Walter Elliot, accompanied by representatives of the Ministry of Agriculture and the Board of Trade, presided over a meeting convened at the Ministry of Agriculture on November 21 to discuss the possible effect upon the distributive trades of the emergency plans for the voluntary regulation of the importation of bacon and hams for a period of two months beginning at midnight, November 22-23, 1932.

The following organizations were represented at the meeting: The Produce Agents' Association; the Danish Bacon Company; the Wholesale Produce Merchants' Association; the United Kingdom Association of Multiple Shop Proprietors; the Co-operative Wholesale Society; and the Scottish Co-operative Wholesale Society.

After a discussion which disclosed general agreement as to the desirability of securing equality of distribution during the period of the emergency regulation of imports, a resolution was passed unanimously in the following terms:—

“It is agreed by the representatives present that, so far as practicable, the reduced supplies of bacon and hams should be handled by the same agencies and in the same proportions as hitherto, and that no attempt should be made to take advantage of the temporary regulation of imports to substitute one method of purchase or one channel of supply for another. In particular, f.o.b. purchases should be reduced in the same proportion as total imports.”

The National Diploma in Dairying.—For this year's examination (held September 8–10) for the National Diploma in Dairying, 104 candidates presented themselves, 63 at the English and Welsh centre (The University and British Dairy Institute, Reading), and 41 at the Scottish centre (The Dairy School for Scotland, Auchincruive, Ayr). Included in the 104 candidates were 25 who had previously failed in certain subjects.

Of candidates at the Reading centre, 31 (21 women and 10 men) qualified for the Diploma; and of candidates at Auchincruive, 21 (12 women and 9 men) were successful. No candidate attained the Honours standard at either centre.

Of the 31 successful candidates at Reading, 13 came from the University and British Dairy Institute, Reading; six from the University College, Aberystwyth; three each from Studley College, Warwickshire, the Lancashire County Council Dairy School, Hutton, Preston, and the Midland Agricultural College, Sutton Bonington; two from the Seale-Hayne Agricultural College, Newton Abbot; and one from the East Anglian Institute of Agriculture, Chelmsford. The training institutions of the successful Scottish candidates were not stated in the report of this examination.

The examiners at both centres were: Messrs. R. H. Evans, B.Sc., William Lawson, M.B.E., N.D.A.(Hons.), C.D.A., N.D.D., T. J. Drakeley, D.Sc., Ph.D., F.I.C., A. T. R. Mattick, B.Sc., Ph.D., and H. W. Kersey.

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Foot-and-Mouth Disease.—Since the last issue of this JOURNAL went to press outbreaks of foot-and-mouth disease have occurred at Caistor, near Lincoln, and at Thorpe Arnold, near Melton Mowbray. The usual restrictions were imposed in each case upon an area surrounding the infected premises.

* * * * *

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W.1, on Monday, October 24, 1932, the Rt. Hon. Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders:—

Cambs. and Isle of Ely.—An Order continuing the operation of the existing minimum and overtime rates of wages from November 1, 1932, until October 31, 1933. The minimum rate in the case of horsemen, cowmen or shepherds of 21 years of age and over is 37s. per week of the hours necessary for the performance of their customary duties. In the case of other male workers of 21 years of age and over the minimum rates are 30s. per week of 40 hours in the week in which Boxing Day falls, 48 hours in any other week in winter, 42 hours in the weeks in which Good Friday, Whit Monday and August Bank Holiday fall and 51 hours in any other week in summer, with overtime at 8d. per hour on weekdays and 10d. per hour on Sundays, Boxing Day, Good Friday, Whit Monday and August Bank Holiday. In the case of female workers of 18 years of age and over the minimum rate is 5½d. per hour with overtime at 7d. per hour.

Cheshire.—An Order fixing minimum and overtime rates of wages to come into operation on November 1, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until April 30, 1933. The minimum rate in the case of male workers of 21 years of age and over is 31s. (instead of

32s. 6d. as at present) per week of 54 hours with overtime at 8d. per hour (instead of 8½d. per hour as at present). In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 6d. per hour for all time worked.

Lincs. (Holland).—An Order fixing minimum and overtime rates of wages to come into force on October 30, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until October 28, 1933. The minimum rates in the case of male workers of 21 years of age and over are 32s. 6d. (instead of 33s. 6d. as at present) per week of 39½ hours in the week from December 25 to 31, 1932, 48 hours in any other week in winter, 41 hours in the week from April 9 to 15, 1933, and 50 hours in any other week in summer, with, in addition, in the case of cattlemen and shepherds, 6s. per week, and in the case of horsemen, 10s. per week, to cover employment (other than overtime employment) in excess of those hours. In the case of shepherds certain payments have also to be made in respect of the lambing season. The overtime rates for male workers for 21 years of age and over are 10½d. per hour on Saturdays, 1s. 1½d. per hour on Sundays (including Christmas Day, 1932), 8d. per hour on Good Friday and 9d. per hour for all other overtime employment. In the case of female workers of 15 years of age and over the minimum rate remains unchanged at 6d. per hour for all time worked.

Northants and Soke of Peterborough.—An Order continuing the operation of the existing minimum and overtime rates of wages from October 30, 1932, until October 28, 1933. In the case of male workers of 21 years of age and over the minimum rates are 30s. per week, 41 hours in the week in which Boxing Day falls, 50 hours in any other week in winter, 42½ hours in the weeks in which Easter Monday and Whit Monday fall and 52 hours in any other week in summer, with overtime at 9d. per hour on weekdays and 11d. per hour on Sundays, Easter Monday, Whit Monday and Boxing Day. In the case of female workers of 18 years of age and over the minimum rate is 6d. per hour with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays, Easter Monday, Whit Monday and Boxing Day.

Staffordshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates to come into operation on November 6, 1932. The minimum rate in the case of male workers of 21 years of age and over is 30s. (instead of 31s. 6d. as at present) per week of 54 hours with overtime unchanged at 9d. per hour. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5d. per hour with overtime at 6d. per hour.

Yorkshire (East Riding).—(1) An Order fixing minimum and overtime rates of wages to come into operation on November 24, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until November 23, 1933. The minimum rates for male workers are as follows: in the case of workers living in, 32s. per week or £81 12s. 0d. per year for foremen, 29s. per week or £73 19s. 0d. per year for beastmen and shepherds, 28s. per week or £71 8s. 0d. per year for waggoners (these rates being in each case 1s. per week less than those at present in force) with lesser reduced rates for lads and beginners; and in the case of workers of 21 years of age and over not boarded and lodged by their employers, 32s. per week (instead of 33s. per week as at present) with lesser reduced rates for younger workers. The hours in respect of which the above rates are payable remain

unchanged as follows : 39½ hours in the week in which Christmas Day falls, 43 in the week in which Good Friday falls, 52½ in any other week in summer and 48 in any other week in winter, with in addition in the case of workers living in not more than 12 hours per week on weekdays and 3 hours on Sundays spent on the care of and attention to stock. The overtime rates for male workers of 21 years of age and over remain unchanged at 10d. per hour on weekdays and 1s. per hour on Sundays, Good Friday and Christmas Day. In the case of female workers of 16 years of age and over the minimum rate of wages remains unchanged at 6d. per hour with overtime at 9d. per hour.

(2) An Order fixing special differential rates of wages for overtime employment of male and female workers on the Corn Harvest of 1933. In the case of male workers of 21 years of age and over who are not boarded and lodged by their employers, the rate is 1s. 3d. per hour, and in the case of male workers who are boarded and lodged by their employers 1s. per hour for foremen, beastmen, shepherds and waggoners. In the case of female workers of 16 years of age and over the rate is 11d. per hour.

Yorkshire (West Riding).—An Order fixing minimum and overtime rates of wages to come into force on November 24, 1932 (i.e., the day following that on which the existing rates are due to expire), and to remain in operation until November 23, 1933. The minimum rates in the case of male workers living in range from 31s. 6d. per week or £81 18s. 0d. per annum for foremen, to 21s. 6d. per week or £55 18s. 0d. per annum for workers in their first and second years of employment, these rates being in the case of foremen, beastmen, shepherds and waggoners, 1s. per week less than those at present in force, and in the case of all other workers living in, 1s. 6d. per week less than the existing rates. These rates, which include the value of board and lodging as defined by the Committee, are payable in respect of a week of 48 hours in winter and 52½ hours in summer, with, in addition, not more than 12 hours per week on weekdays and 3 hours on Sundays spent in connexion with the care of and attention to stock. In the case of waggoners and other horsemen, beastmen and shepherds not living in, of 21 years of age and over, the minimum rates for the same number of hours are 40s. 6d. per week (instead of 41s. 6d. as at present). In the case of other male workers of 21 years of age and over the minimum rates are 34s. 6d. (instead of 35s. 6d. as at present) per week of 48 hours in winter and 52½ hours in summer. The overtime rates in the case of male workers of 18 years of age and over remain unchanged at 11d. per hour on weekdays and 1s. 1d. per hour on Sundays. In the case of female workers of 18 years of age and over the minimum rate is unchanged at 5d. per hour for a week of 44 hours with overtime at 6d. per hour.

Carmarthen.—An Order continuing the operation of the existing rates from November 15, 1932, until November 14, 1933. The minimum rate in the case of male workers of 21 years of age and over is 31s. for a seven-day week of 54 hours with overtime at 8½d. per hour. In the case of female workers of 18 years of age and over the minimum rate is 5d. per hour with overtime at 6d. per hour.

Radnor and Brecon.—An Order continuing the operation of the existing minimum and overtime rates of wages from November 1, 1932, until April 30, 1933. The minimum rates in the case of male workers of 21 years of age and over are 29s. 6d. per week of 50 hours in winter and 54 hours in summer, with overtime at 9d.

per hour. In the case of female workers of 18 years of age and over the minimum rate is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

* * * * *

Enforcement of Minimum Rates of Wages.—During the month ending November 14, legal proceedings were instituted against eight employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

County	Court	Fines imposed			Costs allowed			Arrears of wages ordered			No. of workers involved
		£	s.	d.	£	s.	d.	£	s.	d.	
Gloucester	Chipping										
	Campden ..	1	0	0	0	10	0	15	0	0	1
Hereford	Abbeydore		*			—		22	17	8	1
Lincoln,											
	Lindsey Louth ..	6	0	0		—		7	0	10	3
Warwick	Tamworth	12	0	0		—		65	8	10	3
Wiltshire	Malmesbury	2	0	0	1	0	6	36	18	4	1
Worcester	Tenbury	3	0	0		—		11	1	6	2
Yorks, E.R.	Withernsea	1	11	6	0	7	6	8	8	0	1
Yorks, W.R.	Wetherby		†			—			—		1
		£25	11	6	£1	18	0	£166	15	2	13

* Dismissed under Probation of Offenders Act. † Case dismissed.

* * * * *

APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS :

ENGLAND

- Berkshire :** Miss A. Wingfield has been appointed Recorder of Egg-Laying Trials *vice* Miss I. Caldwell.
- Durham :** Miss L. Wilkinson has been appointed Recorder-Manager of Egg-Laying Trials *vice* Miss W. Allison.
- Lancashire :** Mr. J. R. Lockhart has been appointed Manager-Recorder of Egg-Laying Trials *vice* Mr. H. Blackley.
- Gloucestershire :** Mr. W. P. Owen has been appointed Manager-Recorder of Egg-Laying Trials.
- Lines (Kesteven) :** Miss F. J. Bellamy has been appointed Assistant Manager of the Kesteven-Lindsey Egg-Laying Trials *vice* Miss E. C. Martin.
- Northants :** Miss M. A. Thompson has been appointed Assistant Instructor in Poultry-Keeping *vice* Miss E. T. Wilson.
- Shropshire :** Mr. W. D. Peggott has been appointed Recorder-Manager of Egg-Laying Trials *vice* Miss B. Halford.
- Wiltshire :** Miss O. Dawkins has been appointed Manager of Egg-Laying Trials *vice* Mr. J. O'H. Letts.
- Yorkshire :** Miss G. Spurr, N.D.P., has been appointed Instructor in Poultry Husbandry *vice* Miss M. J. Carter.

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NOTICES OF BOOKS

The Structure and Composition of Foods. By A. L. Winton, Ph.D., and K. B. Winton, Ph.D. Vol. I.: *Cereals, Starch, Oil Seeds, Nuts, Oils, Forage Plants*. Pp. xiv+710 and 274 figs. (London : Chapman & Hall, Ltd. New York : Wiley. Price 55s.)

In this treatise, which is to be regarded as a work of reference for the scientific reader, the authors have brought together, in an admirably

orderly manner, a comprehensive mass of information relating to the macroscopic and microscopic structure and the chemical composition of the cereals, oily seeds and the forage plants. Their aim was to "collect, select, summarize and unify, so far as expedient, results on the composition of a great variety of products scattered through numerous journals, and to add their own contributions, largely hitherto unpublished, on the gross and microscopic structure of these products." This aim has been realized in the fullest sense, and the result is a text-book that will be welcomed with gratitude by every worker in the domains of human and animal nutrition. No library of works dealing with the scientific aspects of agriculture can be considered complete without this volume. An insight into the treatment of the subject may best be gained from the authors' introductory statement: "The classification is first by economic groups, second by parts—fruits, seeds, leaves, etc., third by families, fourth by genera and fifth by species. After brief statements of origin, habitat, botanical relationships and uses, the scientific subject matter is treated under three main heads: (1) macroscopic structure, with due regard to morphology; (2) microscopic structure, which is equivalent in most cases to histology or morphology of the tissues; and (3) chemical composition of the natural product and when practicable of its parts separated mechanically whether in the laboratory or in the factory. Subordinate to (1) and (2) is a section showing the chief structural characters, and subordinate to (3) are often sections showing the composition of the manufactured products."

The subject matter ranges over a wide field, and an immense store of facts, many of which are not to be found in the usual text-books dealing with the chemistry of plant and food products, becomes available to the reader. The treatise will for this reason be of special value to the teacher and research worker, to whom the many illustrations, reproduced with exemplary clearness, as well as the numerous references to papers of original research, will also prove of great help. It may be noted that a companion volume, dealing with vegetables and fruits, is in the course of publication. Scientific workers will look forward to its appearance with genuine interest.

A Manual of Beekeeping for English-speaking Beekeepers. By E. B. Wedmore. Pp. xxiv+413. 40 illus. (London: Edward Arnold & Co. Price 15s.)

It is open to doubt whether a really satisfactory manual "for English-speaking beekeepers wherever found" can be compiled without considerable travel and first-hand research in other countries. In default of this, the author of this work appears to have relied largely, for his external information, on the writings of others whose names are not disclosed. The defect of this quotation on the large scale is shown by the inclusion of various conflicting statements and theories that might well prove bewildering to the novice. The book, therefore, demands for its perusal something more than an elementary knowledge of the craft; and its chief merit lies in the survey it contains of ideas put forward from time to time in connexion with apiculture, the value of which the experienced beekeeper will be able to sift and assess.

Economic Survey of Agriculture in the Eastern Counties of England, 1931. *University of Cambridge, Department of Agriculture, Farm Economics Branch Report No. 19.* Pp. vii+89. (Cambridge: W. Heffer & Sons, Ltd. Price 2s. 6d.)

This report presents an analysis of the financial results, for 1931, of nearly 1,000 farms in the counties of Norfolk, Suffolk, Essex, Hertford, Cambridge (excluding the Isle of Ely) and Huntingdon. In these

counties there is a wide variety of soil types, ranging from the light blowing sand of the Norfolk "breck" to the heavy London clay in the south of Essex and Hertfordshire. For the purposes of the survey, attention was confined to the three principal soil types of the district, namely, (1) loams, (2) clays and (3) chalks, sands and gravels. Records were obtained from holdings of 20 acres and upwards in 213 parishes selected as typical of the six counties. Holdings devoted to fruit or market gardening, hobby farms and other specialist types of undertakings were excluded from the scope of the inquiry. The holdings surveyed represent, in area, just over 5 per cent. of the total area of crops and grass, and, in number, just under 5 per cent. of the total number of holdings of 20 acres and upwards, in the six counties concerned. The report points out that the year 1931 was abnormally wet and sunless, and the heavy rains that occurred during the summer months were specially unfavourable to crop production. The receipts from sales of live stock and live stock products were found to amount to nearly 70 per cent. of the gross income of the holdings surveyed, and, where profits were secured, it was found, in most cases, that the farmers retailed milk and/or concentrated on the production of live stock and live stock products, or enjoyed special marketing facilities. The report deals with the main factors influencing profits and with many other details that will be found of interest to members of the farming community.

Recent Advances in Plant Genetics. By F. W. Sansome and J. Philp. Foreword by Sir Daniel Hall. Pp. x+414, 56 illustrations, and 42 tables. (London: J. & A. Churchill. 1932. Price 15s.)

With the rediscovery of Mendel's laws a little over thirty years ago the study of heredity was brought from the realm of empirical to that of exact science. The story of this rediscovery is now classic and is generally familiar. With the next great discovery, the rôle of the chromosomes in connexion with heredity, evolution and the study of species and varieties changed from an almost purely descriptive to an experimental science. The new science of cytogenetics which thus came into being has developed with astonishing rapidity, and all but those immersed in it have been unable to keep pace, while up to the present the experts have been unwilling to bring the new knowledge together in the form of a general monograph, largely on account of the state of flux in which any new science finds itself. The fundamental principles of the science have now, however, become firmly established, and the work under review illustrates this.

The authors open with a discussion of inheritance in the lower plants. An interesting proof that segregation occurs at meiosis is given by tetrad analysis in these plants. The authors then lead on to a description of the various phenomena of inheritance in the pollen (gametophyte) generation of the diploid angiosperms, involving the question of sterility, which is of such moment to the fruit grower. The inheritance of sporophyte characters in the diploid angiosperms follows, various rather complicated phenomena and their factorial interpretation being described in some detail.

The action of the factors is discussed at some length and emphasis is laid on the point of view that no character is influenced by one factor alone, and that no factor acts independently of the other factors making up its genetical background or of the cytoplasm making up its physiological background.

The cytological phenomena associated with inheritance are described and discussed. Darlington's views on chromosome behaviour are adopted, as they, in the opinion of the authors, fit the facts in the

simplest and most satisfactory way. As the subject is of importance for a true understanding of the mechanism of inheritance, it is argued at some length, and evidence of a very cogent nature is presented in support of it, mainly in connexion with the partial chiasmatype theory of crossing over. In this chapter an impressive body of evidence shows how the behaviour of the factors can be correlated with the behaviour not only of particular chromosomes but of particular parts of the chromosome. Just as the atom ceased to be the ultimate indivisible unit of matter, so the gene was apparently doomed to cede the title of unit of hereditary material, and we are assured in the third chapter that the gene is composed of numerous "elements"—which, moreover, occupy different portions of the locus. It is evident that modern theories of the gene are becoming more and more quantitative in nature.

Almost the whole of the remainder of the volume is devoted to chromosome studies and related phenomena. These studies have been attended by signal success in elucidating genetical problems which have baffled geneticists for some time. The apparently capricious behaviour of *Oenothera* and of interspecific and intergeneric hybridization in other plants has been brought into line with cytogenetical laws. The very cases which at one time constituted serious exceptions to the laws have now served to consolidate them and anticipate new ones. Perfectly good taxonomic species have been created artificially, and the question of the nature and origin of species, although not by any means solved, has assumed a very different and more clearly defined aspect as a result of the new knowledge.

The material is highly specialized and not easy to present in readable sequence. The account of results of other workers is occasionally given in such a way as not to be clear to the reader without reference to the original. There are several surprising omissions, especially of reference to important Russian work, e.g., Philiptchenko's views receive no mention in the discussion of "shift" nor do the recent cytological works of Levitsky. Imperfections are inevitable in a work of this nature, however, and no serious student of biology can afford to overlook such a unique presentation of the results of the last few years in the field of cytogenetics as it relates to the plant kingdom.

The Physiological and Genetical Aspects of Sterility in Domesticated Animals. By W. Orr and F. F. Darling. Pp. 80. (Edinburgh: Oliver & Boyd. 1932. Price 2s. 6d.)

Some time ago a Committee was appointed under the auspices of the Department of Agriculture for Scotland for the purpose of considering methods of investigating the subject of sterility in domesticated animals. The Committee agreed that facilities for collecting, examining and storing specimens of the reproductive organs of sterile animals should be provided in order to enable information to be obtained concerning the various aetiological factors concerned and their relative incidence. The Imperial Bureaux of Animal Nutrition, Animal Health and Animal Genetics were requested to furnish for publication bibliographies dealing with the aspects of the subject that fell within their respective provinces. Finally, it was decided to issue, whenever possible, a pamphlet, couched in popular language, and addressed to practical livestock breeders, which would present the facts, explain the hypotheses, and enlist their co-operation in the work of research. These decisions are embodied in the present publication, which is issued by the Imperial Bureau of Animal Genetics, and forms the first-fruit of the Committee's labours. Despite the title, it was inevitable that incursions should be made into the spheres of pathology and nutrition, since each

of these plays its part in the aetiology of sterility. Not the least valuable feature of the brochure is the bibliography by Miss M. V. Cytovich.

The Utilization of Skim Milk in Dairying and Agriculture (*Die Magermilchverwertung in der Molkerei und Beim Landwirt*). By W. Fischer. Pp. 137. (Berlin: Institut für landwirtschaftliche Marktforschung, 42 Invalidenstrasse, N. 4. 1932. Price RM. 6.50.)

The disposal of skim milk is an important problem in all countries where butter production has been highly developed. In Germany the problem has grown more acute in recent years as increasing milk output has led to increased butter production. This book is claimed to be the first comprehensive examination of the German position; but much of the material has a wider interest. After discussing the economic importance of separated milk and sketching the development of various methods of disposing of skimmed milk, the author analyses each outlet in detail. It appears that the consumption of skim milk by human beings in its original form, or converted into half-fat cheese, declines as the general standard of living improves; skim milk will therefore have to be used to an increasing extent in the manufacture of casein and preserved milk products, and in the feeding of live stock. The sections dealing with separated milk as a feeding stuff for pigs, calves, poultry and milch cows contain useful statements of the results of experimental work, chiefly in Germany and Denmark. The book is illustrated with numerous diagrams and tables and is well documented. It fully maintains the high standard typical of the Institute's publications.

Engineering Aspects of the Condensing and Drying of Milk. By A. W. Scott. Pp. 120. (Obtainable from the Secretary, Hannah Dairy Research Institute, Kirkhill, Ayr. Price 4s. 9d. post free.)

This bulletin, No. 4 of the series published by the Hannah Dairy Research Institute, is companion to the preceding bulletin, in the same series, which dealt with the chemical and bacteriological aspects of condensed and dried milks. The present publication is concerned with the mechanical and physical factors involved in the manufacture of these two commodities. It is divided into four parts: the first two deal shortly with the basic principles of heat transmission and evaporation and provide a suitable introduction to Parts III and IV, which discuss the application of these principles to milk condensing and the drying of milk respectively.

In these processes, the most economical removal of water, consistent with maintaining a high standard of quality in the finished product, is the desired object. The heating element in its widest sense is therefore of prime consideration, but in many instances its technicalities are but imperfectly understood. The present work represents a convenient collection and summary of available information on the subject, and lays the foundation for a clearer conception of the problems involved.

The various stages of the manufacturing processes are outlined and the different methods of manufacture described. For dried milk these are conveniently grouped under film drying and spray drying; an account of the process adopted in a British spray-drying factory is also included. Numerous diagrams are used to illustrate the text, which is also strengthened by appropriate examples worked out in detail showing methods of calculating steam and fuel consumption.

The complete bulletin, with appendices and bibliography, constitutes a useful work of reference and should be of interest to all who are responsible for the construction, installation and operation of milk condensing and drying plants.

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NOTES FOR THE MONTH

At the British Association Meeting, 1932, papers were read by Dr. Denham and Mr. Wright of the Institute of Agricultural Engineering, Oxford, and by the well-known innovators in their particular departments of farming, Mr. A. J. Hosier and Mr. D. A. Bomford.

These papers have now been reprinted, under the title of this note, as a bulletin issued by the Institute at the price of 1s. The papers contributed by the last three authorities deal with the specific problems described in their titles, which are, "The Role of the Tractor in Reducing Cost of Production," by Mr. Wright, "Some Problems of Extensive Production with Mechanized Equipment," by Mr. Hosier, and a paper of the same title by Mr. Bomford. Dr. Denham's paper is of a more general character, and surveys basic problems of mechanized farming. A useful and interesting commentary is provided by Mr. C. S. Orwin, Director of the Institute for Research in Agricultural Economics, who needs no introduction to the readers of this journal.

One of the most important considerations that must be taken into account by the advocates of the intensification of farming by the introduction of mechanized methods is the effect that the adoption of their suggestions will have upon concentration or dispersal of the rural population. This is a problem to which little attention has been paid in the past. All those who have paid some attention to rural problems have discussed the decline of the rural population both in proportion to the general population of the country and absolutely. The introduction of more machinery appears to be one of the factors that will still further reduce the numbers of those employed upon the land, but it is possible that this may not be so. The intensive production that may follow more complete mechanization of farming processes may lead to greater employment, although that seems unlikely. Mr. Bomford points out that the introduction of machinery on

his farm has not led to a reduction in the number of his employees, but it is relevant to remark that the use, for instance, of the plant-setting machine has increased his area of spring cabbage from 12 to 40 acres, and that the country does not possess an unlimited supply of land that can be taken in for cultivating. It is true that there is at present a great deal of land under-cultivated, as there has been for some years past, but the physical resources of the agricultural land of the country are not inexhaustible.

Naturally, Mr. Wright's paper is somewhat technical, and he supplies a number of useful observations dealing with the efficient use of the tractor. He points out that the use of the tractor involves many problems other than that of the actual care of the machine itself, and he suggests some practical solutions for some of the existing difficulties. He discusses at some length the important question of the correct load to be given to any tractor and the best speed at which it should be driven, as well as the best size of tractor to be purchased. Mr. Hosier and Mr. Bomford deal with the problems they have been confronted with in developing the mechanization of dairy farming and market gardening respectively.

It is not possible in a brief note to indicate fully the contents of this bulletin, but it will be well for all those who are interested in, or are thinking of developing, the mechanization of their farms to give it their serious attention.

* * * * *

AGRICULTURE throughout the Empire owes a debt of gratitude to Lord Bledisloe, Governor-General of New Zealand.

for undertaking to deliver the annual
The Cawthron Lecture, the most important
New Zealand scientific oration of the year in the
 Dominion, and for taking as his subject
 the wide field of recent agricultural
 research. The lecture, which was delivered on October 3 last,
 has now been reprinted in pamphlet form.*

Lord Bledisloe is a distinguished agriculturist and a great administrator. For many years he has been interested in the furtherance of scientific research in agriculture, and the first Imperial Agricultural Research Conference, which achieved such noteworthy success in 1927, and over which he presided, was in great measure due to his foresight and influence. He was for some years the Chairman of the Lawes Agricultural

* Copies may be obtained from Messrs. Whitcombe & Tomba, Ltd., 3 Addle Hill, London, E.C. 4, price 1s.

Trust, and in that capacity was largely instrumental in establishing for the Rothamsted Experimental Station the high rank which it holds among research stations of the world. In taking for the subject of his lecture "A Conspectus of Recent Agricultural Research," therefore, Lord Bledisloe undertook to survey a field with which he was peculiarly well acquainted, and on which few, if any, are qualified to speak with greater authority. From an intimate knowledge of most of the research centres whose work is reviewed, and a capacity to select from the wealth of material just those examples that are of prominent importance to agriculture in these difficult and changing days, he has produced a review which is not only intensely interesting to read, but is educative in the highest sense of the word.

In this brief note it is impossible even to indicate the wide range of subjects embraced by the lecture. Soil nutrition, from the standpoint not only of mineral fertilizers but of the microscopic forms of life that have such an important effect on the supply of plant food ; recent revolutionary discoveries regarding the treatment and use of grass land ; live stock feeding, with special reference to modern research into vitamins and mineral elements ; the treatment of milk and milk products ; animal feeding ; meat storage problems ; fruit and fruit storage investigations ; plant pest control ; and developments in the field of farm mechanization—these and many other topics are dealt with in a way which holds the reader's interest and keeps him thoroughly abreast of modern scientific progress throughout the Empire, and, indeed, in other parts of the world. The review is based on information drawn from a vast number of reports, and is interspersed with comments of the wise practical character that one would expect from its distinguished author. Not only agriculturists, but all who are interested in the scientific development of food production, should read it.

* * * * *

THE following note has been contributed by the Wool Industries Research Association, Leeds :—

Details of the official tests of the

Sheep-Branding Fluids : Results of Investigations	durability and scourability of the sheep-marking fluids recommended by the Wool Industries Research Association are now available. These tests have been carried out under supervision throughout the Empire, and a comprehensive report on the results obtained has been presented
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to the Association by Mr. J. Barritt and Mr. A. T. King. In their report they remark that to meet requirements a sheep-branding fluid must be permanent as a brand and yet be easy to remove in the scouring process, and they proceed to deal with the various fluids tested. The report states :—

Of the fluids recommended in 1926 (King and Smith, *Wool Record and Textile World*, 1926, October 7 and 14), the one designated “13,” which had been satisfactory for use in this country, on further trials in the Dominions was found to be lacking in lasting properties; while the alternative formula 36A, suggested as of greater permanence, became, after a season’s exposure, unduly resistant to scouring. Accordingly, a modified formula was developed, which was first tested in 1928, and since that time has been manufactured on a considerable scale. This has been submitted to thorough tests both from the growers’ and the manufacturers’ standpoints, as a result of which the Association is now in a position to make definite recommendations for home and Dominion conditions. The report continues :—

In spite of the widespread campaign against the use of tar and similar materials, their use is not yet discarded. Recently, in reply to our query as to what black fluid had been used in certain trials, we learnt that it was composed of a mixture of varnish and pitch. Again, where our fluids as supplied have required a little thinning fluid, despite specific instructions as to what “thinner” to use, the farmer, in some instances, has employed boiled linseed oil.

The position, however, is undoubtedly much better than it was some years ago. As the possibility of buying reliable sheep-marking fluids becomes more widely known, the use of tar, pitch, etc., will eventually cease, and with it the objectionable contamination of the fleeces that has caused such serious inconvenience and loss to the manufacturer.

Colour of the Fluid.—Reports from growers in different districts vary greatly regarding the legibility of the same fluids made up with varying pigments, the nature of the soil having a pronounced effect. With few exceptions it can be said that the red is the best general-purpose fluid. Brands made from green and blue fluids, while suitable in some districts, notably Ireland, are apt to become covered with a greyish film that renders the mark, although still present, difficult to read.

Manufacture of the Fluid.—Certain unsatisfactory trials have been found to have been so because the fluid was made

up incorrectly; usually, the grinding plant has been inefficient and a gritty product has resulted. The trials described below are on fluids made up by, or under the supervision of, the Wool Industries Research Association.

The 1928-9 Fluid Suitable for the Dominions.—This fluid has been subjected to exposure trials in almost all the Dominions, and, where possible, the branded fleeces have been forwarded to this country and processed commercially. The detailed reports indicate the success of the fluid both from the growers' and the manufacturers' standpoints. The brand is now always removed completely in a normal commercial scour. The composition of the fluid is :—

	<i>Parts by weight</i>						
Wool fat	30
Resin	20
Carnauba wax	3
Kieselguhr	18
Ignited iron oxide	6
"Emco" spirit to consistency.							

Processing of Marked Wools.—With regard to removability of the brands in subsequent scouring, an official test was arranged by the Bradford Chamber of Commerce. The Chamber submitted the unscoured and scoured wools and finished fabric to an independent examination by a committee appointed by the Bradford and District Manufacturers' Federation. They reported that nothing detrimental could be traced in either the woollen or the worsted fabric after scouring, and concluded: "We are of opinion that no detrimental effect can arise from the use of the Wool Industries Research Association fluid, provided that the marking is done in a similar way to that which has been used in the tests, and also that the subsequent processes of scouring, etc., are such as have been employed on the fabrics we have examined."

Other commercial tests, the results of which are enumerated in the report, are similar in character.

Fluids Suitable for British and Similar Conditions.—The demand for sheep-marking fluid in the British Isles is sufficient to warrant the use of a fluid somewhat different in character from what may be described as a general-purpose fluid, and which has been referred to previously as 1928/8 Red. The reasons why it has been thought advisable to suggest a separate fluid are :—

- (1) Conditions do not demand so resistant a material as is necessary for the Dominions, and therefore a fluid can be produced which is very easily removed in ordinary wool scouring.
- (2) This fluid is more easily prepared.

The fluid has the following composition, and will be designated 1928/1. The addition of the wax, while not seriously affecting the ease with which the brand is scoured out, produces a harder and more durable mark than the otherwise very similar formula 13 previously recommended.

	<i>Parts by weight</i>					
Wool fat	150
Carnauba wax	10
Barytes	70
Colour	17.5
White spirit to consistency.						

The colours used have been ignited iron oxide (Red) and ignited chromium oxide, Cr_2O_3 (Green). This 1928/1 Red has been used in Wales and Ireland and the results of the trials have been satisfactory.

The report concludes : In work of this character it becomes almost impossible to acknowledge individually all those who have been of great service. Our grateful thanks are tendered to the Government Departments in the Dominions, to the many farmers at home and abroad who have conducted the branding tests, and to the various manufacturers in this country who have carried out the processing of the branded wool.

For information regarding sources of supply—i.e., for agencies duly authorized to sell these fluids, and from whom only authentic or guaranteed fluids made to W.I.R.A. formula can be obtained—application may be made to the Wool Industries Research Association, Torridon, Headingley, Leeds.

* * * * *

IN an article on "Milking Machines," published in the July, 1932, issue of this JOURNAL (p. 317), the following

**Milking
Machines**

sentence occurs : "The report of a survey undertaken by the International Institute of Agriculture in 1927 was included in the *International Review of Agriculture*, 1929, and this stated that mechanical milking was widely practised throughout Europe and was particularly adaptable to family farms, since it permitted greater production of milk per acre."

The International Institute of Agriculture has drawn the attention of the Ministry to this passage, which it does not consider correctly represents the purport of the *International Review of Agriculture* article :—

(1) in stating that mechanical milking "permitted greater production of milk per acre," because the *International*

Review article held that, "other things being equal, if machine milking is properly managed there should be no difference between the quantities of milk produced by either the hand or machine method"; and

- (2) in stating that "mechanical milking was widely practised throughout Europe and was particularly adaptable to family farms. . . ." It is contended that this statement formed no part of the *International Review* article "and is in fact contrary to the opinion of the writer."

It should be explained that the article in the *International Review of Agriculture* was a digest of 49 papers on mechanical milking which had appeared in various German, Swiss, Danish, Norwegian, Dutch, French and American technical publications; and, in summarizing the opinions therein expressed, the writer disclaimed any attempt "to formulate a judgment on machine milking in general, specially since the contradictions in the literature are largely due to variations in local conditions."

As to item (1) above, the International Institute appears to have misapprehended the significance of the words "production of milk *per acre*." It was never the intention of the article in this JOURNAL to suggest that mechanical milking would increase the yield *per cow*. The main conclusion drawn by the *International Review* writer from the material considered was that "the chief advantage of mechanical milking lies in its making farmers independent of the scarce and costly labour that hand-milking requires and in making it possible to keep large herds of dairy cattle even where there is a shortage of skilled milkers." It was not an unreasonable deduction, therefore, that the ability to keep a larger head of stock would permit a "greater production of milk *per acre*."

As regards item (2), the statement that "mechanical milking was widely practised throughout Europe" was certainly not given in the *International Review* article, but was an assumption, possibly unwarranted, based on the number of European countries whose relative literature had been consulted. The further statement that this method of milking "was particularly adaptable to family farms" was an inference drawn from the cited opinion of the German writer, B. Martiny, described as "one of the most competent of the writers," who "contends that the milking machine is particularly suited to small farms because it makes the small farmer independent of costly skilled labour." Upon this

contention, the *International Review* writer expressed no opinion, one way or the other.

The reference in this JOURNAL's article to the paper in the *International Review of Agriculture* may, however, by its brevity, have led to some misunderstanding, and for this reason the Ministry desires to draw the attention of readers to the points raised by the International Institute of Agriculture in connexion therewith.

* * * * *

SINCE the scheme for certifying wild white clover seed crops was launched three years ago, over 10,000 acres have been inspected at the request of the occupiers, and 7,000 acres have been recorded as suitable to produce "certificated" seed. About 5,000 acres are graded as "A," which means that they are pastures at least 10 years old. The remaining 2,000 acres are of "B" grade. These consist of fields that have been sown or renovated less than 10 years ago, but with wild white clover seed that came off 10-year-old pastures. No fewer than 230 growers, spread over 20 English counties, have fields recorded under the scheme.

**Certificated
Wild White
Clover Seed**

In spite of these remarkable figures it is unfortunately the fact that very few certificates for actual seed crops have yet been issued. Only seven applications for certificates were made during the whole of last season; but that may have been due largely to the poor harvest conditions of 1931. This year a substantial increase may be expected if growers will take the simple steps necessary to get the certificate and so secure to themselves the full advantage of the scheme.

If the registered seed growers are to reap the benefits of this organization of theirs, they must show that they themselves attach importance to the certificate. It is not sufficient to tell prospective purchasers, "This comes off a field that has been inspected by men from the Ministry." Growers should get the certificate itself; show it to anyone who inquires for the seed; and quote the reference number on it when they make a sale. Until reasonable quantities of certificated seed are known to exist, inquiries for it are likely to meet with disappointment, while organized publicity is out of the question.

The scheme is operated by the Central Wild White Clover Committee (of the National Farmers' Union), 45 Bedford Square, W.C. 1. Any registered grower who harvested a seed

crop in 1932 from one of his recorded fields should get a form of application for a certificate either from the County Secretary of the National Farmers' Union, or from the Central Committee, without delay. Among the 230 growers there must surely be many who should be offering this season certificated seed.

* * * * *

**Agricultural
Machinery
Testing
Committee**

THE undermentioned Certificates and Reports, issued by the Ministry, have been published in pamphlet form :—

No. 40. The "Welfiltr" Milk Strainer, submitted for test by the manufacturers, Messrs. Wessex Supplies, Ltd., Wells, Somerset (2d. net, post free 2½d.).

No. 41. The "Excelsior" Automatic Cattle Drinking Bowl, submitted for test by the manufacturers, the Salopian Cattle Bowl Company, Prees, Whitchurch, Shropshire (2d. net, post free 2½d.).

Copies of these pamphlets may be obtained, at the prices stated, through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C. 2.

* * * * *

A WORLD Grain Exhibition and Conference will be held at Regina, Canada, during July and August, 1933, under the patronage of His Excellency the Governor-General, and with the support of the Canadian Federal and Provincial Governments.

**World's Grain
Exhibition**

Erratum.

Line 17 of the note on the World's Grain Exhibition (page 897) should read: "will normally be 10s."

thus helping to stimulate cereal production in this country. Competitive exhibits from England and Wales must be inspected and certified by the Ministry of Agriculture and Fisheries before dispatch to Regina. The fee for this service will normally be 15s.

Other European countries that have already consented to participate actively in the exhibition are Italy, Portugal, France and Belgium.

In addition to the competitive exhibition a Conference will be held of experts from every grain-producing country

in the world, with the object of pooling knowledge on every phase of production and marketing. Several leading British agriculturists have received invitations to present papers to the Conference, and it is confidently expected that the British Government will send a delegation.

An industrial section of the exhibition is also being arranged, so that grain producers may be able to inspect the latest developments in farm machinery and implements, and in food products.

* * * * *

IF maximum profits are to be obtained from a laying flock it is essential that all unsatisfactory layers be eliminated as early as possible. By systematic and skilful culling it is possible to discover and dispose of birds that, for a variety of reasons, are unlikely to prove good layers. This selection is done at the rearing stage, and by its means many substantial economies in food and housing costs can be secured. Further, the observations made during culling provide a most useful guide to the health and general condition of the birds, and to the efficacy of the methods employed.

Culling of Poultry

Successful culling largely depends on an acquaintance with the physiological principles involved, together with skilful practical application of such knowledge. Culling is taught at many agricultural instructional centres, and demonstrations are frequently given by County Poultry Instructors. The value of culling is becoming increasingly appreciated, and, with the object of increasing and hastening this appreciation, and of providing a reliable guide, the Ministry has just issued a Bulletin* on the subject. This publication, written by Miss Helen Molyneux, N.D.P., a lecturer at the National Institute for Poultry Husbandry, who has made a special study of culling, is a complete survey of contemporary practice prefaced by a simple but thorough description of the physiological basis. Particular care has been taken in selecting a series of illustrations that should greatly simplify the subject and enable the novice to become proficient in the application of the principles underlying this valuable aid to success.

* * * * *

*Bulletin No. 59, *The Culling of Poultry*, obtainable through a bookseller or from H.M. Stationery Office, price 9d. (by post 10d.).

THE REGULATION OF MEAT IMPORTS OTTAWA AND EMERGENCY ARRANGEMENTS

IN the October issue of the JOURNAL, reference was made to the Agreements entered into with the Dominions at Ottawa, so far as they affected home agriculture. The full text of the various Agreements is set out in the First Schedule to the Ottawa Agreements Act, 1932, which received the Royal Assent on November 15 last.

The arrangements regarding the quantitative regulation of imports of meat into the United Kingdom are contained in a Declaration by the United Kingdom Government, which appears as Schedule H of the Australian Agreement, and in a letter from Mr. Coates to Mr. Baldwin appended to the New Zealand Agreement. References also appear in the South African Agreement as regards mutton and lamb, and in the Canadian Agreement as regards bacon.

The Declaration by the United Kingdom Government states that the grave depression in the live stock industries of the United Kingdom and the Dominions, resulting from the low price-levels of frozen meat, is likely, if continued, to bring about a serious decline in production, and consequent injury to the consumer. It is, therefore, essential to take whatever steps are feasible to raise the wholesale prices of frozen meat "to such a level as will maintain efficient production." As a foundation, the principles of an Empire meat policy are declared to be (1) to secure the development of home production, and (2) to give to the Dominions an expanding share of imports into the United Kingdom.

Further, the United Kingdom Government, with the object of effecting the earliest possible improvement of the position, undertakes to arrange for the regulation of the importation of frozen mutton and lamb and frozen and chilled beef from foreign sources during a period of 18 months from January 1, 1933, to June 30, 1934. The maximum quantities that may be imported into the United Kingdom during each quarter of this period, expressed as a percentage of the corresponding imports in the corresponding quarters of the two months ended June 30 last, which is referred to as the "standard year," are given at the top of page 900.

The United Kingdom Government further agrees not to impose, during the period January 1, 1933, to June 30, 1934, any restrictions on imports of Australian and New Zealand meat. The Australian and New Zealand Governments, for their part, undertake to limit the export of frozen mutton

MEAT	1933				1934	
	Jan.- March	April- June	July- Sept.	Oct.- Dec.	Jan.- March	April- June
Frozen mutton and lamb	90	85	80	75	70	65
Frozen beef (carcasses and boned beef)	90	85	80	75	70	65
Chilled beef ..	100	100	100	100	100	100

and lamb to the United Kingdom in 1933 to an amount equivalent to the total imports from Australia and New Zealand respectively in the standard year. The Australian Government also undertakes to use its best endeavours to ensure that, in 1933, the exports of Australian frozen beef to the United Kingdom shall not increase by more than 10 per cent. over the quantity sent in the standard year; a similar limit is also contemplated by New Zealand. It will be noted that Australia and New Zealand are under no obligation to regulate their shipments after the year 1933.

The Agreements envisage a possible change in the method of import regulation in the light of experience and, in any event, before the end of June, 1934. The policy of the United Kingdom Government is to endeavour to arrange discussions during 1933 with all meat-supplying interests—home, Dominion and foreign—for the purpose of working out a permanent plan for the organization of supply.

Failing an agreement as to a permanent plan, the reductions imposed on foreign imports are to continue for the remainder of the five years of the Ottawa Agreements at the maximum rates in force in the second quarter of 1934, unless otherwise agreed between the Governments concerned.

After June, 1934, the United Kingdom Government will be free to regulate the imports of Dominion meat, but it is provided that, in any scheme of regulation, the United Kingdom Government shall have regard to the policy of securing to the Dominions an expanding share of imports.

If, at any time, it is found, after inquiry, that the supplies of meat are inadequate to meet the requirements of consumers in the United Kingdom, the Government may remove restrictions then operative until supplies are again adequate.

In the South African Agreement, the United Kingdom Government undertakes to make provision for the import of South African mutton and lamb in any future system of import regulation.

The bacon question was of importance throughout the Ottawa Conference owing to the interest of Canada in pig

production for the export bacon market, and also to the minor interest of Australia and New Zealand in the export of frozen pork carcasses for curing in England. The situation, however, was governed by the domestic policy of the United Kingdom Government as declared in announcements made in the House of Commons in February and April, 1932, regarding the setting up of a Commission for the reorganization of the pig industry and the quantitative regulation of bacon imports.

The Agreements with Canada, Australia and New Zealand provide in varying terms for the introduction of a system of quantitative regulation of bacon and ham imports as soon as possible after the Report of the Commission has been presented. This Report* was presented on October 13, 1932, and the Government's decision was announced by the Minister of Agriculture in the House of Commons on December 19, 1932, in the following terms:—

"I am glad to be able to announce that the Government, for its part, has decided to accept, in principle, the recommendations of the Commission. That is to say, it is prepared to take whatever steps are necessary to facilitate the establishment of a recognized bacon industry in this country on a firm footing, to provide for its expansion within reasonable limits, and to regulate imports, by arrangement or otherwise, so far as may be requisite for the purpose. Enabling legislation is in course of preparation and will, I hope, be introduced soon after the House resumes."

In the Canadian Agreement, the United Kingdom undertakes that, in any legislation that it may submit to Parliament for regulating the supplies of bacon and hams, provision will be made for free entry of Canadian bacon and hams of good quality up to a maximum of $2\frac{1}{2}$ million cwt. per annum. In 1931, imports of bacon and hams from Canada amounted only to some 122,000 cwt., though in 1925 imports from Canada amounted to nearly $1\frac{1}{2}$ million cwt.

The Emergency Arrangements.—While the Ottawa Agreements Bill was before Parliament, the wholesale prices of meat, more particularly of home-killed beef, mutton and lamb, continued to decline, and the prices of fat and store stock fell to or below pre-war levels.

It was clear that the advantages accruing from the Ottawa Agreements would come too late to save producers in this country from serious losses, and it was accordingly decided to take action to relieve the market by seeking a reduction in the imports of all the chief kinds of meat forthwith. As

* Report of the Reorganization Commission for Pigs and Pig Products, Economic Series No. 37, obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 1, price 6d.

a result of discussions between United Kingdom Ministers, on the one hand, and representatives of Dominion and Foreign Governments and shippers and importers, on the other, the following voluntary arrangements, to take immediate effect, were made* :—

(a) *Beef, Mutton and Lamb* (November 7, 1932).—The South American shippers agreed to reduce their marketings of chilled beef in the United Kingdom by 10 per cent., rising, if necessary, to 20 per cent. during the months of November and December, 1932. They also agreed to put into effect a cut of 20 per cent. in their marketings of mutton and lamb over the same period. These reductions apply to the quantities which they had arranged to supply before the agreement was reached.

The Australian and New Zealand Governments also agreed, without prejudice to their position under the Ottawa Agreements, to reduce their shipments of mutton and lamb to the United Kingdom in November and December, 1932 ; in their case, the reduction is 10 per cent. of their shipments in the corresponding month of 1931.

No emergency reductions were arranged in the case of frozen beef.

(b) *Bacon and Hams* (November 23, 1932).—A “ gentlemen’s agreement ” was reached with foreign countries to the effect that shipments of foreign bacon and hams to the United Kingdom would be reduced for two months from November 22, 1932. The extent of the reduction is between 14 and 15 per cent. on the average monthly imports from foreign sources in November and December, 1931, and January, 1932, or a reduction of a little over 20 per cent. on the foreign supplies received in October, 1932. Permitted imports have been divided among the supplying countries on the basis of their sendings in the three-monthly period, August to October, 1932, subject to agreed adjustments. These arrangements are of an emergency character, and they have been made without prejudice to the permanent scheme that will follow from the recommendations of the Reorganization Commission for Pigs and Pig Products. It is the intention of His Majesty’s Government to keep the situation under constant review, and to consult the foreign Governments interested should the state of the meat market render further co-operation desirable.

* See also speech by Major the Rt. Hon. Walter E. Elliot, M.C., M.P., Minister of Agriculture and Fisheries, House of Commons, November 7, 1932

(c) *Regulation of Deliveries from Cold Store in the United Kingdom.*—Importers agreed to regulate deliveries of meat from cold stores in this country in such a way as to assist in securing stability of prices at a sounder level.

(d) *Equality of Distribution.*—On November 21, 1932, at a meeting at the Ministry of Agriculture, representatives of bacon importers, wholesalers, multiple shops and co-operative societies agreed unanimously to the following Resolution with respect to the maintenance of an equitable distribution of supplies during the emergency period :—

“It is agreed by the representatives present that, so far as practicable, the reduced supplies of bacon and hams should be handled by the same agencies and in the same proportions as hitherto, and that no attempt should be made to take advantage of the temporary regulation of imports to substitute one method of purchase or one channel of supply for another. In particular, f.o.b. purchases should be reduced in the same proportion as total imports.”

(e) *Advisory Committee.*—An expert Committee, under the chairmanship of the Marquess of Linlithgow, has since been appointed, jointly, by the President of the Board of Trade, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, with the following terms of reference :—

“To be a Committee to watch, and advise the Government upon, the operation of the emergency scheme for the voluntary restriction of imports of meat (including bacon and hams) into this country.”

(f) *Continuance of Arrangements.*—In the House of Commons, on December 22, 1932, the Minister of Agriculture announced the Government's decision to continue these arrangements in the following terms :—

“I am fully aware of the importance of maintaining the recent improvement in the conditions of the meat market and, as I have informed the House, the Government have been giving close attention to the position that would arise if the present arrangements for the voluntary regulation of meat markets were allowed to lapse. The Government have, accordingly, decided that, in the general interests, negotiations shall be undertaken with a view to the continuance of these arrangements so far as may be necessary. Discussions will begin forthwith, and I feel sure that the Government can count on the same ready co-operation as on the previous occasion.”

Administrative Procedure under the Ottawa and Emergency Arrangements.—An Order has been made by the Board of Trade under the Ottawa Agreements Act providing that, as from January 1, 1933, no foreign meat to which the Ottawa restrictions relate shall be imported except by the holder of a licence from the Board. The arrangements for regulating foreign imports have been greatly facilitated by the voluntary

co-operation of importers. The bulk of the trade is controlled by the South American Meat Importers' Freight Committee, covering the trade from the River Plate and Brazil. There is also a group of importers who ship from Patagonia. Each of these groups has separately agreed to reduce its total shipments to the Ottawa percentages. Some small shipments from other sources have been dealt with separately.

The regulation of Dominion shipments under the Ottawa scheme is governed solely by the undertakings given by the Australian and New Zealand Governments.

Under the special emergency arrangements, the undertakings of the Governments and interests concerned have been accepted as adequate.

* * * * *

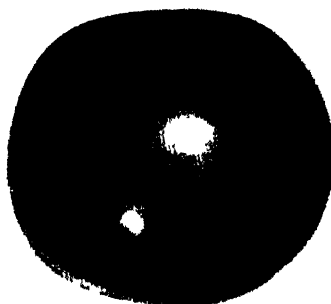
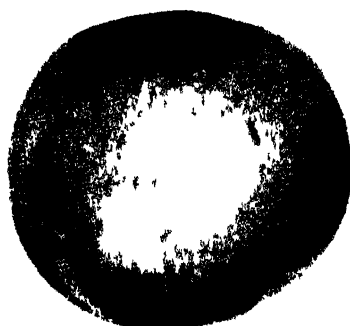
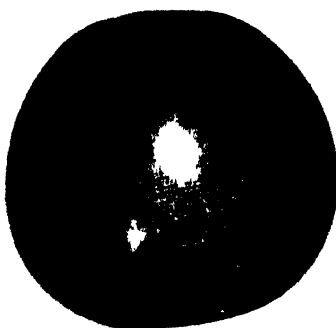
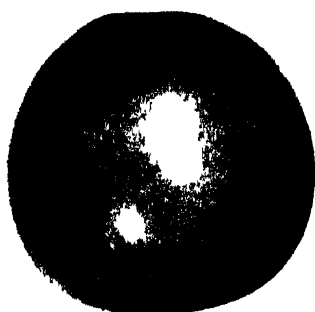
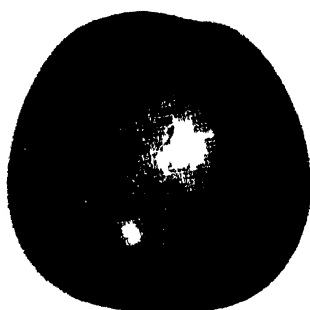
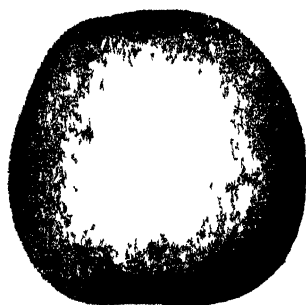
THE COLOURING OF APPLES AFTER GATHERING

H. GOUDE, N.D.H.,

Horticultural Superintendent, Norfolk County Council.

COLOUR in dessert apples is considered by growers and salesmen to improve the commercial value of the fruit. For many years, at the Burlingham Horticultural Station, we have practised a method of improving the colour of apples, after they are picked, by exposing them in trays to sunlight and weather for a period of about 10 days. As the fruits receive any available sunshine and also night dews, we refer to the process as "Sun-Dewing." Young, vigorous trees produce fruit lacking in colour, and the same can be said of old trees of vigorous growth that are too thick with branches and young wood. The fruits that have grown in the shade of leaves and shoots colour very readily when exposed. The skin layers are more tender and more active than those of fruits that have coloured on the trees.

Green fruits of Cox's Orange Pippin, Ellison's Orange, Allington Pippin and Laxton's Superb will develop a decided red or crimson colour, after a few days' treatment, on the exposed area of the fruit. If it is desired to colour the under-side of the fruit, they are turned, in order to face up to the light the uncoloured part of the apples, and the whole surface of the fruit is then coloured. When this method is followed, the fruits react more quickly to the light exposure if they are set out in trays immediately after picking. If they are stored, the pigmentation layer under the epidermis will not respond



Left row — Allman World
 Center row — Lixson Super
 Right row — Newell World

at once to light, and it takes a longer period for the fruit to develop the desired colour.

This method requires no expensive apparatus and can be followed by any grower who desires to add more colour to his fruits before marketing. At the Station, this season, we "sun-dewed" about half-a-ton of choice apples and recorded the results and observations made during the trials. At the Commercial Fruit Shows at Wisbech and Norwich, we exhibited the coloured fruits, and contrasted them with specimens as picked and stored in the usual manner, and they were the centre of interest at each place. The fruit was sold by auction after the Norwich Show, and the green specimens realized 3s. per tray, as compared with 5s. 6d. per tray for the coloured ones.

Sun-Dewling.—The usual method of cultivation at the Station aims at securing colour in the fruits on the trees by the usual cultural methods of low nitrogen soil-content, and thinly-disposed branches in the trees, and we do secure a high proportion of perfectly-coloured fruits. The green and poorly-coloured specimens that invariably occur in the crops are then finished off, before storing, by the "Sun-Dewling" process.

As the fruits are being picked, they are partly graded. The green fruits are placed in separate boxes. Potato trays are lined with a layer of inodorous wood wool, or clean moss, to hold the moisture. The green fruits are then packed, with eyes upward, in one layer on the wood wool, until the tray is filled. The trays are then placed on the roof of the tool shed, facing full south, and are then covered with fish netting to protect the fruits from birds. When the trays are in position, the fruits and trays are thoroughly wetted with clean, soft water. During the "sun-dewling" the fruits are not allowed to become dry. In sunshine or drying winds, water is sprayed over the fruit through a syringe or watering-can.

It is necessary to maintain a moist atmosphere around the trays to prevent evaporation from the fruits, or shrivelling would commence. Last season, it was only necessary to spray the fruits on three days. The water-spraying was carried out about mid-day. This provided the fruits with sufficient moisture through the short sunny periods that usually prevail at that time of the year. At the end of the 10 days and nights, the fruits were coloured and firm. They were then transferred to empty trays, two or three layers thick, and placed in the store.

Damage from frost has not been experienced, but, if any frost occurs, it is washed off the fruits with clean water before the sun's rays reach the position. The fruits shown in the accompanying coloured plate are average specimens of "sun-dewed" apples and controls as picked and placed in the store. The coloured fruits were placed in position on the tool shed roof on October 3, 1932, and, after having been exposed for 10 days and 10 nights, were taken into the store on October 13, 1932. Sunshine was recorded on three days, and the total sunshine during the period was 12 hours. The period was dull and wet, and, for three days, heavy gales of wind were experienced. The "sun-dewed" fruits keep longer before maturing than the fruits of the varieties stored straight from the trees, and the flesh quality is improved. The treated fruits also have a pronounced resistance to store-rot troubles.

We have been repeatedly questioned at County Shows as to the cost of "sun-dewing." The reply is to estimate the cost of labour and material for lining the trays, placing the trays in position, watering the fruits, etc. The total would not be more than 1s. per cwt. of fruit.

"Sun-dewing" can be carried out equally well by placing the prepared trays of fruits on the soil in an open position. When this is done the fruits must be protected from slugs, rats, mice, and sometimes earwigs.

Apples with a greasy skin do not respond to the process. Newton Wonder can be improved in colour, while Norfolk Royal will develop a bleached appearance. Worcester Pearmain will improve in colour if specimens are green before they are subjected to "sun-dewing" treatment, but this variety shows a tendency to bleach if coloured fruits are exposed. The colour and skin texture of commercial varieties of pears have also been improved by "sun-dewing."

Our "sun-dewing" trials are to be continued at the Burlingham Horticultural Station, and further information will become available on this method of colouring apples.

In this season's trials, I desire to acknowledge the valuable help that has been rendered by Mr. P. E. Cross, N.D.H., Horticultural Instructor for East Norfolk, who supervised the trial and recorded the results, with the assistance of Mr. William Read, the foreman in charge at the Station.

THE DEVELOPMENT OF POULTRY-KEEPING AND ITS FURTHER POSSIBILITIES IN SOUTHERN ENGLAND

Major C. H. EDEN,

General Inspector, Ministry of Agriculture and Fisheries.

THE following is the substance of a paper read at a meeting of the Reading Provincial Conference, October 4, 1932 :—

The development of poultry production made rapid strides in Great Britain after the war, and especially so in southern England. The production of eggs was the main object, and this received far more attention than table poultry.

Poultry farms sprang up rapidly all over the country, being started, in many instances, by people who had little or no knowledge of the subject—in many cases mainly because, as a result of some war disability, an outdoor life had been recommended. It was thought to be an easy life that would give quick returns and big profits. Facilities for training were available to a limited extent, and a few of the new poultry keepers took advantage of them, but by far the larger number had to buy their experience. Some of these people did well through sheer grit and hard work. There were, however, many failures, and would probably have been more had it not been for the very efficient and practical help that many of the new workers received from the County Poultry Instructors. At that time the idea was prevalent that no very special knowledge is necessary, but that anyone can “keep chickens”—as they can after a fashion and on a small scale. The task of making the hens keep the poultry farmer, however, is a skilled job requiring long hours.

It is surprising that people should imagine that they can take up poultry production without special knowledge, whereas they would never think of doing so in any other business. On the whole, many successful farms were built up, and to-day some of the finest stock can be found in the southern counties. The success of a leading commercial egg farmer, Mr. S. G. Hanson, influenced many people, who substantially copied his methods.

Building material was very expensive just after the war, but large numbers of surplus army huts were available, and these were, in many instances, converted to the more peaceful use of housing poultry. For a commercial egg farmer, the practice then was to keep large flocks of 400 to 500 birds—in some cases, even larger numbers—housed and run together.

These flocks consisted, in practically every instance, of White Leghorns, which were found to be the most suitable breed for that purpose. The land allowed was at the rate of about 400 birds to the acre on arable land, and it was divided so as to give alternate runs. Kale was grown to provide the necessary green food. Grass land was also used, but as the area allowed was often inadequate, that portion which surrounded the houses became foul. Sometimes efforts were made to overcome this by confining the birds in bad weather, but in those days the necessity for allowing the direct ultra-violet rays to reach the birds was not fully realized, and the stock suffered in consequence. For a time these farms prospered, but it was found that such large flocks were difficult to control. In many cases, the houses were faulty in design; and the birds developed colds which, if not speedily checked, turned to roup, with disastrous results.

Facilities for education and instruction developed rapidly, and it was not long before its influence was felt. The National Poultry Institute was established, and various problems began to be tackled by research stations. Also, it was not long before Poultry Instructors were to be found in every county in England, and the demand upon their services became so onerous that, in many instances, it has been necessary to appoint assistant instructors to enable the work to be dealt with adequately. Besides providing lectures and itinerant instruction, local authorities started various schemes that received the sympathy and financial aid of the Ministry. The Egg and Chick Distribution Scheme, which had been started and run by the Ministry during the war, was taken over by the county authorities, and the conditions have been amended and tightened up from time to time; an effort is now being made to make this scheme of still greater value. Its title has been altered to Accredited Poultry Breeding Stations, and it is hoped that, before long, a National Register of station holders will be started.

County laying trials commenced in 1920, and 38 counties are now conducting them. The influence they have exerted is undoubted, and it is interesting to note that, in the 1924-25 trials, 609 birds were competing and gave an average of 156.61 eggs per bird, whereas in the season of 1930-31 the number of birds had increased to 6,450 and the egg yield to 182.33 for the 48 weeks.

A further development in connexion with county trials took place in 1928, when the Cockerel Scheme was introduced,

enabling further use to be made of the best birds in the county trials by breeding from them under official control.

On the commercial side, also, rapid progress has taken place in recent years, and many new systems and methods have been tried. The size of flocks has been reduced and, in general, 100 to 150 birds are regarded as constituting a more profitable unit for commercial egg production. The intensive system has also been largely extended, and in many instances is giving very satisfactory results; the increased knowledge of poultry-house design and of the nutritional requirements of the hen have largely contributed to this. It has undoubtedly proved of great benefit to those whose area of land is limited. Quite recently, there has been a tendency to introduce somewhat extreme intensive methods, but sufficient time has not yet elapsed to say how far these will prove successful.

It was not until recent years that the general farmer turned his attention seriously to poultry, but the advantages which he possesses over the poultry farmer place him in a favourable position. Take, for instance, the Fold system, which has been adopted on a large scale by Mr. Hosier, who has some 4,000 birds housed in about 150 of these portable houses. It is not a new system, having been used many years ago, when it was known as the Morant system. It has undoubtedly great possibilities, and is extending rapidly in the south. The system is very suitable for the general farmer, for to make the best use of it a large area of land is necessary. The birds are kept in small units, and small units invariably give a better output of eggs, while they are under complete control, and any birds showing signs of disease are at once detected. It also enables the land to be evenly manured.

There are, of course, other systems suitable for the farmer, and it is not possible to say that any one system is the best for all types of farms.

One important question is whether it is preferable for the farmer to keep his own breeding stock and carry out all the detail work of pedigree breeding, incubation and rearing, or whether this should be left to the specialist poultry farmer. It is largely a question of economics; if the farmer can purchase three- or four-months-old pullets from a reliable source and at a reasonable price, then it is probably the best method for him to adopt.

A few years ago we were apt to scorn the methods employed on general farms, but even if the number of eggs produced

was not what is expected to-day, and if the methods of collecting and marketing them were, in many instances, very bad, the health of the stock was, on the whole, good and probably better than often prevails to-day. Our knowledge of feeding has increased, and a ration providing protein, formerly generally absent as far as farm poultry stock was concerned, is now fed. There are, however, signs that disease and mortality are on the increase, and the lack of stamina in some strains is noticeable. It is a danger signal that must not be ignored.

No one can foretell the future, but world-wide depression has affected the prosperous conditions that prevailed a year or two ago, and it is certain that only those who adopt efficient methods will be able to carry on successfully in the future. In a recent economic survey, it was found that some made a profit of 10s. whilst others incurred a loss of 2s. per bird. There is more need than ever for education, instruction and research work, and it is well that such efficient county agricultural staffs are available, for it is certain that there will be an even greater demand for their services than there has been in the past.

The general farmer is recognizing more and more that if he is to get the utmost value from poultry, these must be treated as a unit; and he wants advice as to how they can best be made to fit in and give the best results with general farming operations.

In the past, it has been left to the County Poultry Instructor mainly to give advice on poultry matters, and much of his work is of a specialized nature which he alone should undertake; but when a general farmer or small-holder asks for advice, there might be closer co-operation with the County Agricultural Organizer, for the two officers could, with advantage, consider the problem jointly from a farming aspect.

Unfortunately, very little experimental work has been carried out on the best methods of running poultry on the farm, and what information is available is generally only obtainable from the personal experience of farmers who have tried various systems on their own farms.

There is, also, scope for closer co-operation between the various members of College and Farm Institute staffs. The possibility of carrying out experimental work and demonstrations of "poultry on the farm" should be seriously considered at an early date. The problems that require tackling are

many. For instance, poultry run on grass land will enrich it, but how many birds should there be to the acre? This is an important question, as, with good management, the land can be improved, but, on the other hand, poultry can do a great deal of harm if mismanaged. Again, with the idea of improving the land, is it preferable to run a small flock permanently, or would it be better to have a larger flock for a short period? Is it desirable to add any other manure? If so, when should it be applied and at what rate; and is the extra expense justified by the increased herbage or feeding value thus obtained? Given that the land will provide keep for a definite head of other stock, is it possible to increase the number by means of the poultry manure? With the fold system, how often is it desirable to bring the house and run back on to the same piece of ground? These problems will, of course, be governed by location, soil, weather and other matters, but they are mentioned as a basis for discussion. Many, perhaps all, Colleges and Farm Institutes now have poultry departments, but few undertake to supply a practical demonstration of poultry combined with other farming operations. These departments are more in the nature of poultry farms, and are educational in that way, but as many of the students will be returning to farms, there to carry on general farming operations, they should be able to gain information which will help them to give poultry their proper place in the general working.

Poultry were at one time considered almost a nuisance on the farm, but as conditions became more and more difficult, farmers turned their attention to the possibilities of poultry-keeping, and it was found that, in many instances, poultry-keeping served to keep the farmer's head above water. Let them be recognized, therefore, as having a definite place in farming operations, and let us strive to improve methods in poultry-keeping that will help the farmer on the road to the renewed prosperity that we all hope is not far distant.

THE DISTRIBUTION AND CONTROL OF THE GREAT STINGING NETTLE

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NETTLES are common weeds in countries of temperate climate. The Great Stinging Nettle (*Urtica dioica* L.) is the best known of the three species recognized in the British Isles, where it is a weed of primary importance, although its prevalence varies with locality. Particularly troublesome in some districts, it calls for little consideration in others, apart from its unsightliness in odd places. Chiefly notorious for the capacity to inflict painful stings, it has, also, some uses for which it has been cultivated.

In the following notes, the Great Stinging Nettle is considered mainly from the ecological standpoint, i.e., from the study of its distribution, its habitats and the factors that influence its associations. This, it is thought, may help to elucidate certain misconceptions, and to indicate rational methods of prevention and eradication.

Description.—The Great Stinging Nettle is a perennial with creeping runners, propagating both vegetatively and by seed. When fully grown, the plant is 2 to 3 ft. or more in height, according to soil conditions and situation; the plants are taller in shady places than in the open.

The seedling and its development are described by Long^{1*} as follows: "The seedlings have a thread-like root, and long, smooth, light-green hypocotyl. The cotyledons are nearly round, with an indentation at the apex, about $\frac{1}{16}$ in. in diameter, light green, hairy above, and stalked. With further growth of the seedling, the cotyledons may be slightly enlarged. The first leaves are cauline with a short petiole, opposite in pairs, somewhat oval, but not regularly so, very slightly lobed or toothed, hairy above and beneath, both leaf-stalk and stem bearing whitish hairs."

"In still larger seedlings, the stem is roughly square, often tinged with red, the leaves are ovate to cordate, and deeply toothed. The whole plant is covered with stout hairs, which seem to be hardly capable of stinging. The seedlings are much more hairy than the Small Nettle (*Urtica urens*)."

In the mature plant, the leaves are opposite in pairs on

* The references are given at the end of the article, page 922.

the stem. They are about 2 to 4 in. long and are borne on stalks. In shape they are ovate, serrated or toothed. The surface is covered with the familiar stinging hairs. The flowers, which appear between June and September, are small and green, and occur in panicles, 1 to 3 in. long, which spring in bunches from the axils of the leaves. The male panicles are loose, and the female densely flowered.

The stems are single or branched. The system of roots and underground runners is of a type found also in several other plants, e.g., the White Dead Nettle (*Lamium album*), Goutweed (*Aegopodium podagraria*) and Hedge Bedstraw (*Galium mollugo*). In the original plant, there is a strong tap root with lateral secondaries. Runners spring from the top of the tap root and spread outwards horizontally at or just below the surface of the ground. These runners bear shoots at their extremities which, upon the death of the original rootstock, form separate individuals; the last again send out runners, but do not form a tap root. Fig. 1 shows runners radiating from a central rootstock through a shingle bed. Fig. 2 illustrates the growth of runners from a new individual.

Harmful Effects.—This nettle is not a common weed on arable land, as its runners are not deep-seated like those of creeping thistle or coltsfoot; and cultural operations prevent its establishment. On arable holdings, it is generally confined to hedgerows and odd corners, where, apart from unsightliness, it does little direct harm. It is, however, always suggestive of neglect, it harbours pests, and is generally undesirable. An even more important reason for eradication is the fact that it is a prolific seeder, and the seeds are windborne. In this way, a patch of nettles on waste ground may be a serious source of infection.

The weed becomes more troublesome when present in grass, where it may range from small patches to almost complete domination of a field. Dense colonies may smother out the grass and reduce the grazing area. With thistles and many other weeds there is a possibility of grazing between the plants, but this does not obtain with nettles.

Distribution and Habitat.—The primary means of distribution is by seeds, which are produced in abundance, and, being very light, may be blown considerable distances. Powers of germination appear to be variable, but there is, at least, no lack of material.

Once the seedling is established and the mature plant developed, a colony is formed by means of runners. As already indicated, the runners are never deep-seated; even in the lightest soil they are only just below the surface; on heavy soils they may be on the surface, but below some superficial sheltering material.

Nettles are popularly held to be characteristic of rich soils, and scientists refer to the plant as nitrophilous, i.e., one occupying situations rich in nitrogen. Frequent reference is seen in literature to the nettle as a typical nitrophilous plant, and it is stated to be partial to the outer walls of the lairages of cattle, swine and horses, where the urine oozes through the walls.² The writer hopes to disprove these contentions, and to offer a satisfactory explanation of the phenomenon.

Hedgerows are frequently populated by nettles, which grow at the base of the hedge and spread outwards at intervals. Banks and waysides are common situations; and heaps of road metal in such situations are often dominated by the plant. Woodlands and heaps of timber or sticks are also habitats. Buildings, both of stone and wood, whether temporary or permanent, or in a derelict state, are frequently fringed by nettles, and the plant will persist to mark the site of a building long after the foundations are hidden beneath the earth and all visible traces of the structure have disappeared. Rabbit burrows are often fringed by nettles, a fact noted by Farrow.³

In surveying many examples of the sites mentioned above, it became apparent that, whatever characteristic they possessed in common, high nitrogen content, or the high soil fertility associated with it, was not one of them. The nettle is often referred to as a shade plant, presumably because it may grow in woods or in the shade of hedges and walls. The writer, however, has found it to be equally common in situations fully exposed to the sun, and to be healthier in appearance, i.e., less aetiolated or "drawn," in sunny positions than in the shade. It is suggested, therefore, that neither the "nitrophilous" nor the shade theory is tenable.

The runners appear to be unable to penetrate resistant material and are more adapted to running through a loose, surface cover than to growing through a light soil. The position that offers least resistance would be the surface of the ground, but cover is essential, as the runners appear to be sensitive to exposure. When the surface cover was removed and the runners exposed to light, they immediately produced

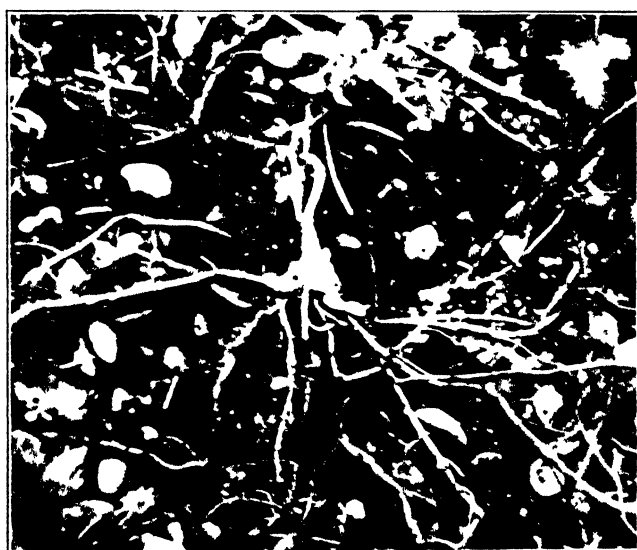


FIG. 1. Showing runners radiating from a central point to a thoroughly shrubby bed.

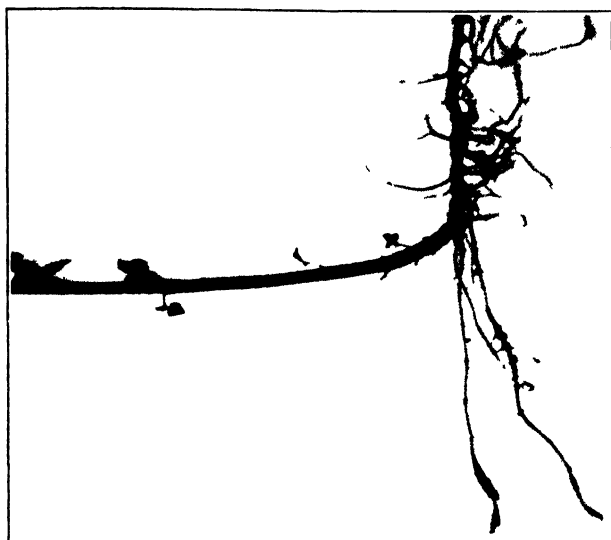


FIG. 2. Showing growth of runners from a new individual.



FIG. 3—Showing nettles appearing through debris in a wood.



FIG. 4—A colony of nettles at the base of a barn wall.



FIG. 5—An artificial test heap of stone built up in a grass field.



FIG. 6—The stone heap shown in Fig. 5, 13 weeks later, dominated by nettles.



1 - Redwood Forest - Havert



1 - S. H. P. O. C. C. C. - Havert



FIG. 9. Nettles growing from hedge across improvised sticky net in the inner field



FIG. 10. Showing eradication of nettles round tree trunk through the treading of cattle

shoots, but these were sickly and stunted and their leaves small and yellow. It would appear that the surface cover is essential to protect the runner from light until it has reached the right state of maturity for shoot and leaf development. The writer's investigations suggest that the main factor influencing distribution is a mechanical one—not a chemical one, nor one relating to light intensity.

Hedgerows.—Nettles are sometimes the most prevalent plant at the base of hedgerows, particularly those on the lighter soils. In the hedgerow itself, they may completely dominate all other vegetation. The hedger finds it almost impossible to clean the base of the hedgerow, and here will be found a compost of soil, road sweepings, dead leaves, weeds and twigs. This material is light and dry, and provides the sort of cover mentioned above. With the large amount of organic matter present, the nitrogen content, as shown by analysis, may be high, but it does not appear to have been determined whether there is much available nitrogen present.

When the bank is kept clean of surface material, nettles will be confined to the base of the hedge, but any litter on the surface is likely to become colonized quickly. An investigation of patches of nettles protruding from the base of the hedge will generally provide some clue as to the material which helped their advance. In an investigation of 50 such patches, chosen at random during excursions along roadways, it was possible to determine the cause immediately in 32 of them. Nine other determinations were made subsequently by inquiry of roadmen and others, who remembered some pre-existing cause; thus 41 out of the 50 patches were determined. The remaining 9 were old-established, and it was reasonable to suppose that the influences with them had been lost beyond trace.

The commonest causes with the above 41 patches were heaps of hedge clippings, or of grass mowings from the bank. Stone, gravel, or sand heaps are also common factors, while such things as tree-trunks and heaps of drain-pipes have been noted as being responsible.

Ditches.—Cleanings from ditches, thrown at the edge of the bank, will encourage colonies of nettles. This is particularly noticeable in fen districts, where ditch cleaning is an essential and regular operation. In several instances, where nettles lined one side of a ditch and not the other, it was determined, by inquiry of the occupiers of the land, that the cleanings had been thrown only on the side where the nettles occurred.

Woods.—Woods are often colonized to a greater or lesser extent by this nettle : hence it is regarded by some as a shade plant, although it grows lanky in shade, but vigorously in the open. Fig. 3 shows nettles appearing through debris in a wood. It appears that the coarser and deeper the debris, the stronger and taller are the colonies. Thus, among a heap of sticks, the nettles will be tall, possibly on account of the added support or the struggle to light.

Buildings.—The growth of nettles at the base of walls of buildings, particularly in rural areas, has given rise to the theory that the plant is nitrophilous. As mentioned, there are numerous references in literature to nettles growing round the lairages of live stock, where urine oozes through the walls. It is strange, however, that it has never been remarked that nettles grow with equal vigour, and occur with equal frequency, at the base of the walls of barns, cartsheds and other buildings where there is likely to be little if any nitrogen. Fig. 4 shows a colony of nettles at the base of a barn wall. It will be noted that the roots and runners inhabit the crevice between the wall and the earth, or the loose stones of the foundations. Drippings from the eaves often leave a loose layer of surface material and, as in the hedgerow, any litter or covering body will cause the advance of nettles from the wall. It should be added that litter containing nitrogen is likely to accumulate by the walls of farm buildings, which also afford shade and protection for nettles.

Stone Heaps.—These result from roadmaking operations, demolished buildings, ruins, quarry workings or landslides, and nettles appear to spring up almost automatically. Here, again, it is the loose surface covering, as with a shingle beach, which attracts the plant, for there can be no possible source of nitrogen in a heap of stones.

In an experiment at Hawkeshead Hill, North Lancashire, a heap of stones was built on a patch of grass in a paddock (Fig. 5). The nearest colony of nettles was in the hedge 6 yd. away, but two dwarfed plants were found in the grass, about 2 ft. and 1 ft., respectively, from the heap. The heap was built on July 25, 1931, and a photograph was taken in the writer's absence on October 20, 1931, 12 weeks later. This shows the heap dominated by nettles (Fig. 6).

Rabbit Burrows.—Patches of nettles often mark the large rabbit burrows in warrens and on heaths and banks (Fig. 7). Farrow⁴ explains the persistence of nettles in these positions

as being due to the fact that they are unpalatable to the rabbits, which prefer the heather. This, however, does not explain their appearance, which might be supposed to be due to an accumulation of nitrogen at the mouth of the burrow from droppings and urine. This, however, is not the case, as rabbits do not foul the mouths of their burrows; and an analysis of the soil in which the nettles illustrated grew showed a very low nitrogen figure, lower than that of the surrounding soil, on account of the admixture of sand (see page 919).

The explanation again is the light surface cover formed by the sand thrown out by the rabbits. One may reasonably inquire whether sand deposited by other mechanical means brings about the same result. This was found to be so. On Massingham Heath, where rabbit burrows with nettle colonies were observed, there were two tarred roads intersecting the heath. Sand heaps for tar-spraying purposes lined the roads, and most of the heaps were quickly colonized by nettles (Fig. 8).

Sand and Gravel Heaps.—Heaps of sand and gravel at road sides are often the cause of nettle patches near the edge of the road. Sand appears to be more conducive than gravel. When either has been involved, a colony will remain after the heap has been removed, as it has by that time become established. At Castle Rising and Sandringham, Norfolk, it was observed that, although no nettle colonies were visible in the neighbourhood, nettle seedlings appeared on heaps of sand and heaps of an admixture of marl and gravel. The material in the gravel and marl mixture heaps became solid and cemented together, and the nettle plants grew as detached and bush-like individuals, each having a central rootstock, but no properly developed runners. In the sand heaps, the runners soon ramified the whole mass.

Patches in Fields.—From the grazier's point of view, the cause of nettle patches in fields is the most important point. There are many causes, and all are preventable. In most fields where patches are observed, careful examination or inquiry will usually reveal the cause, although it may have been removed or have disappeared.

Molehills, like rabbit burrows, are a common cause of the introduction of nettles. Molehills often arise on the coarse patches where horses have dunged; the dung attracts worms, which, in turn, attract moles. When the soil is thrown up in this manner over a layer of dead grass, an ideal medium for

the development of runners is provided. Of 32 patches of nettles occurring in fields, it was possible to determine the cause of 27, either directly or by inquiry.

The following are some of the causes for the occurrence of the Great Stinging Nettle in grass fields: molehills, felled trees, stick heaps, straw carted from stackyards, abandoned haycocks, wasted hay, derelict implements, portable hen-houses, site where willows were peeled, rabbit burrows, sacking, sludge heaps carted from ditch, dense carpet of dead leaves from willows, drain-pipes.

It is possible that, in fen soils and light blowing sands, the extremely light condition of the surface soil may provide the necessary open covering layer. Inquiry, however, has usually pointed to the patch having been initiated by one of the causes mentioned, but it is not claimed that this is invariably so on the soils in question.

The Nitrogen Content of Habitats.—To determine whether any actual relationship existed between nitrogen content of the soil and the growth of nettles, samples were taken from various sites on Massingham Heath, Norfolk, which is a typical poor East Anglian heath, partially overlying sand, and partially chalk. The grass is mainly Bent (*Agrostis*) and large areas are covered by bracken or heather. Nettle colonies occurred in the following isolated positions on the heath: rabbit burrows, sand heaps, hedges, pine-woods, the wall of a bullock yard at the outskirts of the heath.

Samples of soil were taken from each site, and from the heath itself as a control, the sampling being done by means of an auger. Ten borings were taken from each of 5 rabbit burrow colonies, 50 borings in all. These borings were made through the sand thrown up by the rabbits and the earth beneath to a depth of 8 in. into the latter. The roots were growing in the earth and the overlying sand.

In the sand heaps, hedgerows and by the bullock-yard walls the samples were taken in the same manner, i.e., 50 borings from each site. In the wood there was a dense carpet of pine-needles, and as these were undecayed and no roots were growing in them, the carpet was removed and the borings taken from the actual soil in which the roots grew. In the sampling of the heath soil, 10 borings were taken from about an acre, round each of the 5 sites.

The following were the figures obtained, the analyses being carried out by Mr. F. Hanley, M.A., Advisory Chemist, School of Agriculture, Cambridge.

No.	Situation	Loss on ignition Per cent.	Total nitrogen Per cent.
1.	Massingham Heath	3.46	.106
2.	Rabbit burrows	2.21	.076
3.	Sand heaps	2.12	.062
4.	Hedgerows	11.42	.364
5.	Walls of bullock yard	7.00	.266
6.	Pine wood	3.60	.102

Organic matter, not passing through an ordinary sieve, was found in Sample No. 4 to the extent of 1.42 per cent., and in Sample No. 6 to the extent of 0.92 per cent. This was not included in the analyses, but the analyst commented on the large volume occupied by this matter, though the weight was small.

The figures indicate that, in Samples Nos. 3 and 6, the nitrogen content is lower than that of the heath (Sample No. 1). In Samples Nos. 4 and 5, the nitrogen content is higher than that of the heath, on account of the large amount of organic matter. The organic matter in Sample No. 5 was due to road sweepings that had been thrown against the wall, and not in any way to the bullock yard itself, which was below the level of the nettle colony.

Nettles are often associated with organic matter and, as organic matter is associated with nitrogen, the nettle has come to be regarded as a nitrophilous plant. In the writer's opinion, it is not the nitrogen but the mechanical effect of the organic matter in providing a light surface covering that is responsible for the appearance of nettles. In other words, the "nitrophilous" theory owes its existence to misinterpreted observations.

In this connexion, there are forms of organic matter that have a low nitrogen content, e.g., straw of cereals. Fig. 9 shows a recently improvized stackyard in a corner of a pasture field. Undecayed straw has formed a surface covering and, in the space of a few months, nettles have advanced from the hedge and dominated the ground.

Prevention.—A consideration of the problem of the Great Stinging Nettle indicates that prevention is possible, and that prevention on waste ground will remove a source of infection to cultivated land. One cannot too strongly condemn the neglect of waste land and similar sites from which the seeds of many species of weeds are easily dispersed to become a nuisance to farmers of clean land.

It has been shown that most soils having a loose surface covering offer the weed a habitat which is so quickly occupied that the weed seems to appear automatically. In the experiment with a heap of stones, the domination of the site was effected in about three months.

The obvious preventive measure is the immediate removal of rubbish that cannot be burnt from the position where it is likely to become overgrown with nettles. Other rubbish should be burnt on the site and the ashes scattered. Hedge banks should be kept clean, and heaps of hedge clippings, dead grass or similar material should be removed. Where it is impossible to remove the rubbish for some time, e.g., heaps of road metal, or material from demolished buildings, the nettles should be pulled out as soon as they appear. This will prevent their rapid spread through the material in question. In pastures, proper surface cultivation is essential. This will take the form of harrowing to remove dead grass and to remove molehills. Rubbish should not be allowed to lie for any length of time, and the sites of felled trees should be watched.

Eradication.—Of a number of means employed to eradicate nettles, reports of experience vary. One person has found success with a treatment from which another has derived little result. This applies to such methods as cutting, salting or dusting with kainit. There is no doubt that lack of system is often responsible for the failure, though not always so.

(1) Grubbing out is practicable on a small scale if it can be carried out efficiently, but it may be very difficult on account of the large number of runners and the way in which they are bound, at intervals, to the soil by roots. Small portions may be left behind and give rise to new plants. The runners should be burnt and not left on a rubbish heap.

(2) Cutting with a scythe or mowing machine will gradually exterminate nettles, if done at regular intervals. Frequent cutting is essential, the rule being never to allow the shoot to grow more than 1 ft. in height. Pressure of other work often renders this regular procedure impracticable and, in the meantime, the plant is able to lay up a store of food in its runners and rootstock. There is no doubt that some plants are extraordinarily efficient in synthesizing and storing food within a very short period of growth, and little is known as to the best intervals at which to cut perennial weeds.

Eradication by mowing is always a slow process and, with

an old colony, having large reserves, may take several years.

Cutting with a mowing machine is believed to be more effective than cutting with a scythe. The latter leaves a clean cut, but the former has a bruising action that causes decay.

(3) Hoeing with an ordinary hand hoe before the plants are more than 3 in. in height is said to be effective.⁵

(4) Dusting with salt at the rate of $5\frac{1}{2}$ lb. per rod, or 6 to 7 cwt. per acre, when the nettles are first cut in spring, is a help.⁶ It must be realized, however, that the use of large and effective dressings of salt may prevent the growth of other crops for some time.

(5) A spray, consisting of a 15 per cent. solution of kainit, applied with a charlock sprayer, has been used in Germany⁶ in destroying young shoots on a large scale. The shoots became black and died off, the area was dominated by grass and, at the time of the hay harvest, the plants appeared to be exterminated. Examination showed that the young shoots were sickly and stunted, while the rootstocks were blackened and had begun to die. It is probable that the action of kainit is due to the salt it contains. Many farmers in this country, however, report little result from kainit or salt, although the treatment has not been carried out under any official supervision.

(6) A method that has come into prominence lately is treatment with a solution of sodium chlorate (NaClO_3). Excellent reports have been received from the Continent of results obtained from a 5 per cent. solution sprayed on the ground after the shoots have been cut away.⁷ It is necessary to remove the shoots to give the spray access to the runners. The solution is then applied at the rate of 1 gal. per sq. yd.

(7) A treatment has been carried out in West Norfolk by Mr. A. Deptford (Rollingham Hall, Wisbech). This has consisted of a simple process of consolidating the ground, and would appear to be a rational procedure in the light of the foregoing investigations on the habitats of nettles. The method adopted was to place a cattle crib (feeding trough) in the centre of the patch. The nettles were completely destroyed by the subsequent treading of the cattle, except when the crib was not moved. In the latter instance, where the protection of the crib had prevented treading, a circular patch of nettles continued to grow in a striking manner.

It has been suggested that the treading might kill all other vegetation as well as the nettles. This effect is only temporary ;

other herbage soon appeared, consisting largely of annual meadow grass and smooth-stalked meadow grass, with perennial rye-grass and wild white clover appearing later. Other suggestions to encourage treading have been to place a lump of rock salt, or even a rubbing post, in the centre of the colony. Fig. 10 shows the effect under a tree where cattle shelter, the result of the consolidating action and not the shade of the tree, as nettles will grow in woods and under trees where there is no treading.

Summary.—(1) The Great Stinging Nettle is a perennial plant with a superficial system of runners. It is adapted to the type of habitat which provides a loose surface cover.

(2) The association of the plant with nitrogen-rich situations, or with the scene of human activity, is incidental and indirect.

(3) Prevention lies in the removal of the conditions favouring the spread of the plant as far as this is possible.

(4) Eradication may be carried out successfully by mechanical and chemical means.

Acknowledgments.—The writer desires to thank Mr. F. Hanley, M.A., Advisory Chemist of the School of Agriculture, Cambridge, who kindly undertook the analyses in connexion with nitrogen estimations; Mr. R. Kissock, B.Sc., who assisted with the photographic work; and Mrs. R. T. Trinder for translating material from Korsmo's book.

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² Tansley, A. G., *Practical Plant Ecology*, p. 26.

^{3, 4} Farrow, E. P., *Plant Life in East Anglian Heaths*.

⁶ *Stinging Nettles*: Advisory Leaflet No. 47, Ministry of Agriculture and Fisheries.

⁷ Korsmo, E., *Unkrauter im Ackerbau der Neuzeit*, pp. 380, 540.

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MARKETING NOTES

National Mark Apples and Pears.—Applications for enrolment under the National Mark Apple and Pear Scheme continue to be received, and indicate that progress is being made. There are now 183 authorized packers of National Mark apples and 29 of National Mark pears.

Consignments of National Mark fruit on the principal markets appear to be considerably heavier than in any previous season, and the prices realized compare favourably with the quotations for ungraded fruit.

National Mark Schemes for Cabbage Lettuce and Cauliflower and Broccoli.—Leaflets explaining the proposed National Mark Schemes for cabbage lettuce (Marketing Leaflet No. 34) and cauliflower and broccoli (Marketing Leaflet No. 35) are in course of preparation and will shortly be available.

The nomenclature of the proposed standard grades will be *Selected Hearted Glasshouse*, *Standard Glasshouse* and *Selected Hearted* for cabbage lettuce and *Selected* and *Selected Large* for cauliflower and broccoli.

The proposed grades, which have been demonstrated at the Imperial Fruit Show and at local shows in the main growing areas, have received general approval.

National Mark Wheat Flour.—Bread-making tests have been carried out at the National Bakery School with samples of National Mark *All-English* (*Yeoman*) flour made from 1932-crop wheat from 10 different sources. The tests afforded further evidence of the suitability of *Yeoman* flour for commercial bread-making. The following observations have been extracted from the Director's report :—

- (1) The flour tested this year did not possess such a high maltose figure as in 1931.
- (2) All the doughs gassed well after the first hour of the fermentation period. As in previous years, a four to five-hour fermentation period is advocated. All the flours carried 15 gallons of water per sack, but for commercial practice not more than 14½ gallons per sack are recommended.
- (3) The flours produced a fairly uniform set of loaves. There were no really bad samples, but several were distinctly inferior to the best. The Coburgs were quite good and could be handled with ease throughout the whole process. It is obvious that certain crusty shapes can be satisfactorily made. All the bread had a good bloom and more uniform crumb-colour than in previous years.
- (4) It was found possible to produce bread of a good colour from all samples, with the exception of one that came to the test fresh

off the mill, though even this one gave good results in a subsequent test after one week's ageing.

- (5) As in former years, the effects on the dough of chilling during fermentation have been studied. It should be emphasized that, if *Yeoman* flour is to be used satisfactorily, chilling of the dough must be avoided, for its effects are much more marked with *Yeoman* flour than with flours produced from blends of wheats. The result may well be a close, stodgy crust showing the bad break formerly characteristic of bread made from English flour before the introduction of the National Mark Wheat Flour Scheme.

No change is recommended in the method of using National Mark flour in commercial bread-making, as set out in Marketing Leaflet 12 E, copies of which may be obtained from the Ministry, free of charge, on request.

An illustration of the test loaves appears opposite.

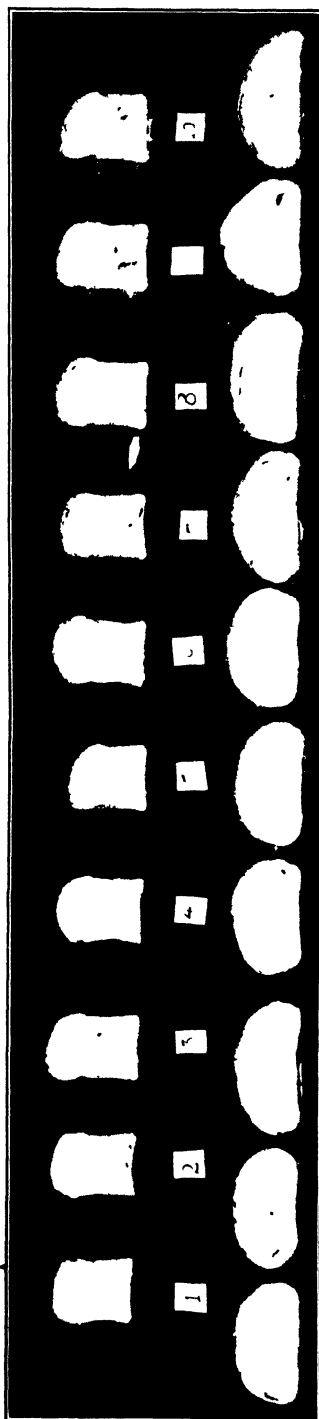
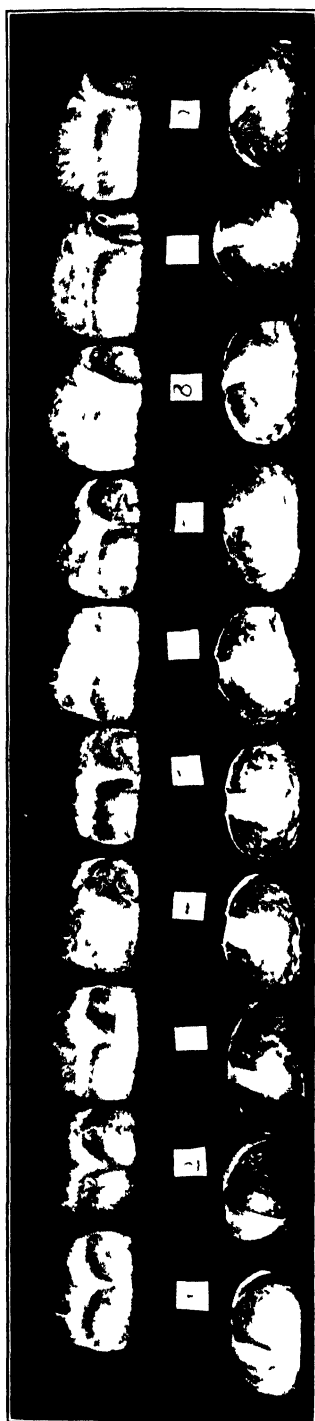
Mr. J. G. Holland and Major A. Seymour Mead have been appointed additional members of the National Mark Wheat Flour Trade Committee.

National Mark Successes at the Imperial Fruit Show.—Reference was made in the December JOURNAL to the successes achieved by National Mark fresh fruit packers at the recent Imperial Fruit Show at Birmingham. It is also significant that, at this Show, all the 39 prizes for canned home-grown fruit and vegetables were taken by 11 National Mark packers, and that in the Honey (United Kingdom) Section, National Mark packers also took all the prizes, except one third prize.

Marketing Demonstrations.—The Mutton and Lamb Marketing Demonstration, showing the suggested grades for home-killed mutton and lamb, was staged at the Birmingham Cattle Show, Nov. 26-Dec. 1, and at the Smithfield Club Show, Dec. 5-9. At both Shows, National Mark beef and poultry were displayed, while at Smithfield a small demonstration of the scheme for the consignment of cattle direct from farm to abattoir for sale on a dead-weight and grade basis was also included.

In co-operation with the County Agricultural Education Authorities, three demonstrations of the testing, grading and packing of eggs under the National Mark Scheme were given during December in North Wales, viz., at Pwllheli (Dec. 14), Corwen (Dec. 16) and Bala (Dec. 17).

Publicity for National Mark Products.—*Flour Cookery Demonstrations.*—Reference has been made in recent issues of this JOURNAL to the holding of National Mark flour cookery



Bread making tests carried out at the National Bakery School with samples of National Mark All-English (3 containers) of 1935, in which it is in the different series

demonstrations by certain gas and electricity supply authorities. The Luton Gas Company held demonstrations twice daily from Nov. 28-Dec. 2, inclusive, and these were well attended. A window-display of National Mark flour and eggs was made at the Company's showrooms at the same time. Further demonstrations will be held in other cities and towns during the first three months of 1933.

Displays.—The Ministry occupied the Empire Marketing Board Shop at Cardiff for a second fortnight from Dec. 19-31 on behalf of home products. On this occasion, the display was confined to National Mark commodities.

National Mark produce will also be displayed by the Department at the Dairy and Ice Cream Convention, to be held at Olympia, London, Jan. 9-12, and at the Birmingham and Midlands Grocers', Bakers', Confectioners' and Caterers' Exhibition, at Bingley Hall, Jan. 19-28. At the former, a section of the Ministry's stand will be devoted to an exhibit dealing with various phases of the milk industry.

Wheat Act, 1932.—The Wheat Commission have made a new by-law extending the period within which a registered grower must apply to an authorized merchant for a wheat certificate to 15 days from the date on which the wheat was dispatched on delivery to the buyer or to his order.

This by-law has been approved by the Minister and came into effect on Dec. 1, 1932.

Wheat sold as a Standing Crop or Unthreshed in Stack.—The Wheat Commission have received a number of inquiries (relating to cases not specifically covered by sub-sections (2) and (3) of Section 13 of the Wheat Act) as to the precise position of incoming and outgoing occupiers of farms in relation to claims for deficiency payments under the Act. In a notice recently issued, the Commission state that some of these inquiries relate to instances where the wheat of a registered grower is sold by auction as a standing crop before harvest, the buyer being entitled to come into the wheat field, harvest the crop, thresh and sell it.

In such cases, the Commission are advised that, under the Sale of Goods Act, the property in the growing crop would pass to the purchaser at the time of sale by auction and the purchaser could then register as the grower of the wheat under the by-laws of the Commission, and after having threshed the wheat, he could sell it, obtain a wheat certificate from an authorized merchant and proceed to claim deficiency payments.

Inquiries have also been made as to the position in cases where wheat in the stack is sold by a registered grower by auction or otherwise. The Commission have been advised that, in cases not covered by Section 13 (3) of the Wheat Act, a person who purchases a stack of wheat from a registered grower is not on the same footing as the purchaser of a standing crop and would consequently not be entitled to be registered as the grower of the wheat. In order that a deficiency payment may be payable in respect of such wheat, the certificate issuable on the sale of the wheat, after threshing, should be applied for by, and be issued to, the registered grower concerned.

Sugar-Beet : 1932 Crop Data.—The following averages have been compiled from data relating to beets delivered to the 16 beet-sugar factories operating in England and Wales during the current manufacturing season up to and including the week ended Dec. 10, 1932.

Averages for the corresponding week in the previous season (17 factories) are shown for comparison :—

Week ended	Average weight of roots		Average sugar content		Average weight of sugar per root	
	(grammes)		(per cent.)		(grammes)	
	1932	1931	1932	1931	1932	1931
October 15 ..	494	410	16.0	17.6	79	72
„ 22 ..	482	397	16.9	17.8	81	71
„ 29 ..	481	393	16.7	17.8	80	70
November 5 ..	472	397	16.7	17.7	79	70
„ 12 ..	465	388	16.8	17.5	78	68
„ 19 ..	463	387	17.1	17.3	79	67
„ 26 ..	471	387	17.1	17.0	81	66
December 3 ..	465	394	17.0	16.8	79	66
„ 10 ..	474	403	17.0	16.7	80	67
Season to date ..	474	395	16.8	17.4	80	69

Production of Home-grown Beet Sugar.—According to returns made by the beet sugar factories operating in Great Britain, the amounts of beet sugar manufactured during November, 1932, and the corresponding month in 1931, were :—

	Cwt.
Nov., 1932	2,355,758
Nov., 1931	2,256,060

The total amounts of sugar produced during the two manufacturing campaigns to the end of November were :—

	Cwt.
1932	3,913,201
1931	3,533,721

Sugar-Beet Acreage, 1933.—Reports received from the various districts indicate a prompt response on the part of growers to the contract terms for the 1933 season. Some factories have already contracted for as much beet as they can handle. It is probable that the acreage under beet next year will show a decided increase over the 255,500 acres recorded in 1932.

Hops Marketing Board : Interim Payment to Growers.—On December 20, 1932, the Hops Marketing Board made (through the Factors) a *pro rata* payment which, added to the £3 per pocket already advanced, represented 80 per cent. of the amount of the Board's valuation of each individual grower's hops consigned to it.

Butter : Pre-packing and Sale under a Common Brand.—The effectiveness of marking and branding as an indication of guaranteed quality tends to be diluted when there is a multiplicity of marks and brands on the market signifying a similar standard. The following resolution passed at a recent conference of Australian butter producers is, therefore, of special interest :—

“That, in view of the definite loss of selling power in the United Kingdom market through the multiplicity of brands, this conference affirms the principle of a single brand for all choicest Australian butter, and as a first step delegates undertake to urge their respective factories to support the proposal.”

A further resolution relating to the prepacking of Australian supplies is of some importance :—

“This gathering considers the distribution of Australian butter in pats an essential feature of successful marketing in Great Britain, and that arrangements be made to this end by the co-operative forces of the Commonwealth.”

The second resolution emphasizes the present-day popularity of prepacked butter, the sale of which is undoubtedly increasing. It indicates that our overseas suppliers are alive to the tendency and are prepared to exploit it to the full. Most of our home-produced butter is already sold in pre-packed form, but, in many cases, its presentation for sale leaves much to be desired. The development of prepacking by overseas suppliers will make it more than ever necessary to improve and standardize the moulding and packing of the home-produced article.

Reorganisation Commission for Fat Stock.—The Minister, on December 21, 1932, constituted an Agricultural Marketing

Reorganization Commission for Fat Stock. The duty of the Commission will be to prepare, in accordance with the provisions of the Agricultural Marketing Act, 1931, a scheme or schemes, applicable in England and Wales, for regulating the marketing of fatstock, and, in the course of preparing any scheme as aforesaid, to investigate and report on any matter which appears to them to affect its operation and in particular to investigate and report on the manner in which its operation could be facilitated :—

- (a) By co-operation between the board administering the scheme and
 - (i) any corresponding board in Scotland or Northern Ireland ;
 - (ii) any board that may be constituted in Great Britain or Northern Ireland for regulating the marketing of pigs or of bacon ; and
 - (iii) any organization concerned with the marketing in the United Kingdom of fatstock or meat produced in the United Kingdom or elsewhere ;
- (b) by the regulation of imports of live stock or meat or any product thereof ;
- (c) by improvement of the facilities for the slaughter of fatstock and for the production of commodities therefrom ; and
- (d) by use of the provisions of the Agricultural Produce (Grading and Marking) Acts, 1928-31.

The composition of the Commission is as follows : Colonel the Rt. Hon. G. R. Lane-Fox, P.C., J.P., D.L., *Chairman* ; Mr. H. G. Howitt, D.S.O., M.C., F.C.A., Sir John Buck Lloyd, Dr. John Boyd Orr, D.S.O., M.C., M.A., M.D., D.Sc., F.R.S., and the Hon. Jasper Ridley.

The Secretary of the Commission is Mr. J. B. Baber, M.C., T.D., and the Assistant Secretary Mr. W. H. Wilkin, both of the Ministry of Agriculture and Fisheries. Communications for the Commission should be addressed to the Secretary at 3 Sanctuary Buildings, Great Smith Street, Westminster, London, S.W. 1.

Canada : Graded and Marked Beef.*—The annual report of the Minister of Agriculture for Canada for the fiscal year ended March 31, 1932, contains the following reference with respect to officially branded beef :—

“ That the advantage of being able to purchase beef which carries some definite indication of quality is being more fully

* *Co-operation and Markets News*, October 28, 1932, Department of Agriculture, Regina, Sask.

appreciated by consumers is apparent from the steady increase in sales of graded beef. Sales of this product for the last calendar year totalled over 17,000,000 lb., and weekly reports which are received from all establishments which are branding beef under the regulations indicate a very gratifying increase in sales for the first few months of the present year."

Queensland Meat Trade Organization.—The Queensland Meat Industry Board, set up under the Abattoirs Agreement Ratification and Meat Industry Act of 1930, was constituted in August, 1931, the members being appointed for two years. The Board, by proclamation, became the owner of an abattoir at Brisbane (formerly belonging to Swift Australian Co., Ltd.) on Nov. 23, 1931, when the first sale of live stock was held at the yards, the abattoir commencing operations two days later.

Its powers are, briefly, to conduct public sale-yards and meat-works, to slaughter stock for any person, and generally to control the meat industry in the prescribed area of its operation and to prevent unfit meat from passing into consumption.

Commonwealth and State Inspection services have been unified at the works; every stage of treatment is subjected to careful scrutiny, and, as the service is linked with the State Department of Agriculture and Stock, the treatment and handling of meat are under effective supervision.

The services rendered are penning, slaughtering, dressing, holding in cold-chamber and loading to truck for the domestic trade, while, for the export trade, the meat is, in addition, cut and bagged as required by regulations, and, subject to space being available, held in cold-storage for a period up to 28 days and loaded to ship's side, the vessels lying alongside the cold-stores.

The Board purchases the by-products (fat, heads, feet and viscera) which it converts into a wide range of commodities. It is also empowered to investigate and control the processes of manufacture, for the first of which purposes a laboratory has been established. Experimental cold-chambers have also been installed and investigations are being made into the conditions affecting the long-distance transport of chilled (as distinct from frozen) beef.

During the 32 weeks ended July 2, 1932, 487,261 head of stock were handled, of which 106,256 were for export.

COUNCIL OF AGRICULTURE FOR ENGLAND

THE Thirty-Ninth Meeting of the Council of Agriculture for England was held at the Middlesex Guildhall, Westminster, on Thursday, December 8, 1932.

The Chair was taken by *Sir Arthur Hazlerigg, Bart.* (Leicester), who reported that at the two Preliminary Meetings of groups of members of the Council, (a) who had been nominated by the Minister, (b) who had been appointed by County and Borough Agricultural Committees, respectively, (a) Mr. Robert Hobbs and Professor A. W. Ashby and (b) Mr. James Hamilton and Sir Douglas Newton, K.B.E., M.P., had been re-elected as members of the Agricultural Advisory Committee for England and Wales for a further period of four years.

Central Landowners' Association's Reports.—*Lord Clinton* moved the adoption of the Report from the Standing Committee on the Agricultural Policy Reports of the Central Landowners' Association (see *Appendix I*, page 940). He pointed out that, although the Standing Committee did not put forward their own Report as agreeing with every detail of the C.L.A.'s proposals, it considered that the majority of them were valuable, and were entitled to very close and careful consideration where this had not already been given by the Government. The underlying feature of the suggestions was to obtain an immediate and considerable increase in the production of home-grown food-stuffs, and to increase employment in the industry. Such a policy must first secure and stabilize a remunerative level of prices for home-grown produce, and give a sense of security to all those dependent on the cultivation of the soil. Lord Clinton discussed the Association's recommendations under the heads of tariffs and quota restrictions of import, and of organizing home production and marketing. Some of the items had been already dealt with by the Government, and he hoped that it had been encouragement to the Minister and his Department that such a strong line of action was put before him in the Reports. He congratulated the Minister very heartily on the action which he had already taken to help the industry.

Brig.-Gen. H. Clifton Brown, M.P., J.P., D.L. (West Sussex), seconded the Report, and, as Chairman of the Committee of the C.L.A., expressed gratification that the recommendations had been considered so thoroughly by the Standing Committee. He referred especially to the harmful effects to the industry of the Death Duties.

Mr. Charles Roberts (Cumberland) said he did not think that it was any use asking the Chancellor to deal with Death Duties. He considered, also, that this and similar agricultural programmes thought too much of the southern and eastern counties and too little of the agriculture of the north. Wheat and sugar-beet were of little interest to the latter. He thought that many of the expedients of economic nationalism which had been recommended had, in fact, broken down the machinery of international commerce to-day and produced the catastrophic falls in prices which had for the time destroyed the economic position of the world. But he had a lurking hope that agriculture in this country was going to get on with reorganization. He hoped that the Minister would press on with the live stock policy on which he had already embarked, and that he would go ahead with other reorganization schemes. *Lord Hastings* (Norfolk) said he did not agree with Mr. Roberts as regards Death Duties. Agriculture really required the introduction of many fresh millions a year instead of the abstraction of capital from it. With the constant withdrawals, there was getting less and less capital to take, and eventually the State might be faced with the necessity of subsidizing existing landowners with credits at low rates of interest, or some other method. It would be much better now to remit the duty. *Mr. Walter Smith* pointed out that the primary objective of the proposals was to give the producer a full return for his services. He did not believe that tariffs and methods of that kind were leading in that direction. There was still the big difference between retail and wholesale prices, and there was the danger that, in rising wholesale prices, the retail price would also be raised, so that the consumer, with his purchasing power being steadily depressed, could buy less and less, with the result that the wholesale markets would again become glutted and the whole trouble begin afresh.

The Report was put to the Meeting and adopted.

Minister's Address.—The Chairman welcomed Major Elliot, Minister of Agriculture, to the first meeting of the Council held since his appointment as Minister.

Major Elliot, in the course of his address to the Council, said that at the present time a second industrial revolution, not less potent than the first, was actively in progress and was affecting more particularly the ancient industry of agriculture, and consequently—and it may be within the next few months, certainly within the next few years—decisions of the most far-reaching importance would have to be taken affecting not

small mushroom things like the factory system of England, but the ancient industry of agriculture, which was literally rooted in the soil of this country. With such a responsibility before him, any Minister must do his utmost to seek counsel and to receive it, as he desired to do from the Council of Agriculture for England. We looked round and we found an agricultural crisis which certainly bore heavily upon this country, but also with enormous heaviness on every other country. It was not an English crisis, not even a British crisis, but a World crisis. The position could not be saved by the adoption of some simple formula, and would have to be reviewed from a very wide angle. The owner-occupier, the small man working his own farm in the United States, was being hit so heavily that tenant farming there was increasing by leaps and bounds, and a system, which he would venture to characterize as the worst of all systems, based on mortgage or investment company advance, was increasing. Again, as regards co-operation, the producer in Scandinavia—an instance of the principle of co-operation—was complaining bitterly of having to produce at a loss—a condition of things that could not continue. Extension of credit was being urged, and yet in Germany moratoria and extensions of credit were resulting in huge burdens of debt, with new measures continually being devised to deal with them. The present problem, therefore, extended so widely as to transcend co-operation, land tenure, credits and moratoria. Neither was it a temporary crisis. It first hit Great Britain in the East : it struck the Eastern Counties a stunning blow and for a long time the West and North stood aloof in a certain conscious rectitude, saying, "Our neighbours are having a bad time ; these foolish people are going in for arable production : there are quarrels also between master and man ; difficulties from which we in the North and West are fortunately free." Then the crisis rolled across England and struck the West, and afterwards the North ; and the sheep farmer to-day was having the trouble which the arable farmer has had for years past. The trouble was spreading from product to product, and now bids fair to swamp the whole agriculture of the island.

Emergency measures had already been taken in regard to wheat, which had been dealt with without raising the price to the consumer. The demand to deal with live stock in the same way might not be able to be met. The pure gospel of cheapness, of buying always in the cheapest market, had now once and for all been abandoned : not only by the Government but by the country, which had crossed the water-shed and was

brought face to face with a whole new set of problems. Labour representatives on the Council had crossed that water-shed long ago, when they said that labour was not a commodity that you should buy in the cheapest market, and that it was right and proper that a reasonable degree of organization on behalf of or by the seller should be undertaken.

In the discussion of the new problems, it was necessary that there should be representation from all parts of the industry. We must march as an army all together, because unless we took counsel we should certainly be cut up and destroyed on the road.

We had found that the problem just now was one of supply out-running consumption and the glutted market was the result. He put it that we had not previously studied the law of supply, only that of demand, and that the economic laws of supply were entirely different from those of demand, so all previous ideas would have to be recast. How were we to tackle this problem of glut? He suggested that for the immediate future we should proceed by the method of contract. If he were asked for a single message to the Council he would say, "Go on thinking about contract": the difference between producing in an unorganized fashion in an absolutely free market and that of producing in an estimated and planned fashion for an anticipated market. That involved, undoubtedly, great difficulties, but we would not shirk them. It was, indeed, for the reason of dealing with such that the Council met. If it were simply a matter of a farmer producing as much as he possibly could and selling it the Council would not be there talking, but would be at home working. The problem was not how to produce but how to distribute. These words were not mere platitudes; they meant business. Here was one of the first documents of the new conception—the Report of the Reorganization Commission for Pigs and Pig Products. He quoted from it the following:—

"The quota is an untried instrument in this country. By other countries it has been regarded as a temporary expedient to be used in a period of crisis without regard to the general merits or demerits, and is not an economic weapon, the use of which is to be restricted, so far as international law permits, to import only. The limited international experience which we have studied well illustrates this doctrine. We believe that the quota method deserves most thorough investigation from a new angle, freed from the common conception of it as a purely restrictive or retaliatory measure. In no country has it yet been regarded as a constructive instrument, which, under suitable conditions, can play a useful part in the economic development of both exporting and importing countries; this is the conception of the quota we advocate for the bacon industry."

It was on the philosophy of the Lane-Fox Report that he was able to call the bacon interests into consultation, and between a Monday and a Friday to come to a satisfactory arrangement with them. In pursuing the method of contract, therefore, we had to deal with the tremendous problem of estimating both market requirements and production at home and overseas. Of all the contractions of purchasing power that had taken place, the greatest contraction was when a million men in this country fell from employment to unemployment. Real wages measured in terms of cost of living have had no such contraction of purchasing power as had been claimed in certain circles. He did not wish to go into controversial matters, but he did say that we should have to examine the problem of estimating needs and production, not regarding the consuming power as a static figure which we could always come back and rely upon, but as one which we were using in endeavouring to counteract our other difficulties. We had to look out, for although we could enormously increase our efficiency by adopting in the country the Gradgrind methods, which were being expelled from the towns, yet the towns would not stomach it if our remedy for the matter was simply to drive Manchester out of Manchester and put it into Norfolk. We must take it that the policy of control had to be applied on all sides of the industry, and that an attempt to get away from the lowest price paid to the smallest number meant, if it was to mean anything, something for the labourer as well as something for the farmer and something for the landowner. The gospel of cheapness had done many great things, including great damage, and undoubtedly at the present moment the strain of the Wages Board system was much felt and complained of in the industry. The system must not be scrapped just at the moment when the country was being asked to accept a policy which was not connected with the gospel of cheapness. The present unfortunate disputes as to wages he hoped would be regarded as rather the last entry on the last page of the policy of cheapness than the first entry on the first page of the policy of control.

We were entering upon a new adventure in agriculture in this country, and we went into it with the more confidence because of what had been done for us by our predecessors in the old days. Our system had stood enormous shocks and had shown a tremendous resilience. Our production per head compared very favourably with any country in Europe, and we possessed better quality of live stock than any other country. We had to marry the old with the new in the venture that lay before

us. It was not to be contemplated that we should throw away the heritage which our forefathers had left ; it was the spirit of that tradition that we desired to carry on. We had the oldest science and the oldest art in the world, and agriculture could not cut itself adrift from its conditions. The farmers and landowners could rest assured that in the Ministry they had a body of co-operators who were anxious to work with them and who recognized the immense importance of the industry, and who also appreciated that they were not the masters but the servants of the industry.

Purity of the Milk Supply.—*Mr. George Dallas*, in moving the adoption of the Report from the Standing Committee on the question of the Purity of the Milk Supply (see *Appendix II*, page 942), said that the Report dealt with something that did not altogether lie with the farmer, but rather with the Public Authority. The great over-riding factor in the milk industry was confidence by the public in the article. A great advance had in recent years been made by farmers in bringing the milk supply to a high standard of purity and quality, and the public should be brought to realize that. Public Authorities in the discharge of their functions were doing some well and some not so well. If all were as keen as the Veterinary Committee of the West Riding Agricultural Committee, then in a short time there would be very little to complain about. He put forward the recommendations in the Report as well worthy of careful consideration. *Major F. H. Fawkes* (West Riding) said there were points to remember. Cleaner milk could be got by buyers paying differential rates according to cleanliness, in the way that many co-operative societies in the North of England were doing. The difference was up to 2d. a gallon more for the cleanest milk. He thought that a standard of cleanliness should be prescribed and milk falling below it—after a due period of notice—should not be allowed to be sold unless properly sterilized. Pasteurization was unnecessary where the milk was clean. Tuberculosis might in time be eliminated with the help of a State Veterinary Service, though that, as the Report said, was a counsel of perfection. Eventually there would, he felt sure, be a State Veterinary Service linked up with Local Authorities, but it would require the closest co-operation of all areas. At present, such happenings as the free transport of new calving cows from one county to another made it very difficult for Local Authorities to control tuberculosis. Backward counties should follow

leading counties in taking adequate measures to detect tuberculosis in milk. It was possible that the scientists examining the disease might yet find a way to deal with it which would not involve a great expense. *Mr. S. Wallace, J.P.* (Herts.), said that there should be compulsory inspection on each farm, as there had been for some years in Hertfordshire, in which county they also had working a system of competitions for clean milk. *Mr. Hobbs* said he was disappointed that no recommendation had been made in the mover's speech as regards eliminating tuberculosis. He did not think that mere clinical inspection could eradicate the disease. *Mr. Dallas*, in replying, said that this was by no means meant to be a final Report by the Committee on the subject, though they considered it a necessary first step in the right direction.

The Report was put to the meeting and adopted.

Reorganization Commission's Report on Pigs and Pig Products.—*Lt.-Col. Sir Merrik Burrell, Bart., C.B.E., J.P.* (West Sussex), moved, the adoption of the Report (see *Appendix XI*, page 947). The Standing Committee's view was that the Commission's Report was comprehensive, constructive and courageous, and that the Commission should be heartily congratulated upon it. He believed that we should in years to come look back on this Report as of epoch-making significance. The quota scheme was to be applied both to foreign and Empire bacon and to home production. Tariffs could not cover all the ground. Farmers might object to selling by contract, but it was absolutely essential if the scheme were to be a success. He was glad to see that certain steps had already been taken. The Minister had done everything that was possible in the short time he had been in office. He could depend upon the Council's full co-operation in the future. *Lord de la Warr*, Parliamentary Secretary to the Ministry, said that the favourable consideration, by the Council, of the Pigs and Bacon Report completed the circle of approval with which it had been received by agricultural bodies in the country. He endorsed Sir Merrik Burrell's statement that agricultural problems always received non-political consideration at the Council. He could not yet announce the Government's full acceptance of the Report, though it was clear that the main lines of it had already been accepted. The farmers and curers were said to be already working on their part of the scheme, and he expressed the hope that they would be ready with their plans as soon as the Government was ready with its decision: they should hurry,

as with the present Minister it was very easy for them to be left behind.

Mr. W. J. Cumber (Berks) asked as to the intention of the Report in respect of the elimination of the smaller slaughter-houses. The meat that made the highest price at Smithfield was not meat killed in London, but close to its point of production. He hoped that the Council would not advise the Government to encourage large-scale abattoirs and slaughter-houses. *Sir Merrik Burrell* explained that the advocacy of public abattoirs did not mean advocacy of the elimination of the small privately owned slaughter-house kept by a butcher who bought and sold locally. *Sir Douglas Newton, K.B.E., M.P.* (Cambs.), said that he thought the Council could accept the Report with confidence. The condition of the pig industry was chaotic : there was no organization, and there was a degree of futility in pig production which almost amounted to madness. In certain other countries organization had gone forward by leaps and bounds. He hoped that the Minister would implement the Report with the utmost possible speed, because much depended on what was done in the next six months.

The Report was put to the meeting and adopted.

Dutch Auction System.—*Mr. Clement Smith, J.P.* (East Suffolk), moved the adoption of the Standing Committee's Report. (See *Appendix IV*, p. 950.)

The Report was put to the Meeting and adopted.

Printed Reports of Council.—*Mr. Denton Woodhead* moved the adoption of the Standing Committee's Report on the Reception by County Authorities of the last two of the more important Reports of the Council. (*Not printed as Appendix.*)

The Report was put to the Meeting and adopted.

Import Duties on Horticultural Products.—*Mr. Cecil Robinson, J.P.* (Holland Division, Lincs.), moved the adoption of the Report from the Standing Committee on the New Special Duties on Horticultural Produce and Potatoes. (*Not printed as Appendix.*) He said that the Report ought to be of assistance to growers of horticultural produce. Nearly 200 acres had been put under glass since the import duties came into force. If the duties were made permanent, the glass acreage would be considerably increased. *Mr. Sole* (Isle of Ely) said that growers felt they had been unfortunately treated in regard to the duty on new potatoes. It should be kept on longer than the end of June. Other members spoke on the Report, and it was put to the meeting and carried.

Resolutions from County Agricultural Committees.—*The Chairman* moved the adoption of the Standing Committee's Report on resolutions, received by the Committee, which had been addressed to the Council by County Agricultural Committees, which was tabled for the information of the Council. (*Not printed as Appendix.*)

The Report was put to the meeting and adopted.

Unemployment Insurance.—*Mr. Denton Woodhead*, on behalf of the Standing Committee, moved the following resolution :—

"That this Council notes the recommendation of the Royal Commission that agricultural workers who are unemployed should participate in the Relief Scheme. It agrees with this recommendation, but considers it to be essential that the Government should take immediate steps to formulate a special scheme of unemployment insurance applicable to agricultural workers, so that their position may no longer be anomalous."

In the course of his remarks, *Mr. Woodhead* said that the Council would be aware that a Royal Commission had been inquiring into the question of unemployment insurance. For the first time, as far as he remembered, there had been a definite recommendation that agricultural workers should share in the scheme. On behalf of the workers, he would like to say that they were grateful ; but the question was how to give effect to the proposal. The agricultural worker was a skilled man, and, as an artisan, a wage of 28s. a week was not sufficient. In the north, a man with a family of four was getting 37s. 3d. from the Public Assistance Committee as unemployment benefit, whilst a man working on the land was getting no more than 28s. This sort of thing was liable to deplete agriculture of its best workmen. It was a small thing to ask that the wage-earner should have an insurance scheme. There had been a suggestion that 6d. a week divided into three parts—the Government to pay half, the worker and employer the other half between them—would be adequate. That, however, was in 1925. To-day, when unemployment was more rife in the industry, the premiums required would probably be heavier. The Royal Commission Report suggested that a further inquiry should be made, but he would suggest that there was considerable information on the matter in the Departmental Report of the Committee presided over by the late Sir Henry Rew, and that it would be better to go forward at once with a scheme than wait for a further inquiry. *Mr. Lovell* seconded the resolution. Other speakers, including *Mr. H. W. Thomas* (Hants.), *Mr. A. E. Bryant* (Bucks.), *Mr. T. C. Ward* (Salop), *Mr. H. C. Gardner* (Worcester), *Mr. George Dallas*, *Major R. G. Proby* (Hunts.), *Mr. Goodwin* (Cheshire), and *Mr. Waller*

Smith, joined in the debate, *Mr. Ward* proposing that the resolution be referred back to the Standing Committee for further consideration, and *Mr. Gardner* seconding the amendment. The amendment was put to the meeting and lost. The original resolution was put to the meeting and carried by a large majority.

Importation of Potatoes.—*Mr. Cecil Robinson* moved the following resolution :—

“ That the Council requests its Standing Committee to consider the existing potato position with a view to an early representation being made to the Tariffs Advisory Committee in favour of increasing the duty on foreign potatoes to 30s. per ton until May 31, 1933; or, as an alternative, that the Government be asked to prohibit the importation of foreign potatoes until that date. Either of these courses would, it is thought, be the means of giving confidence to the producer and would not increase the price of potatoes to the consumer.”

Potato growers, he said, this year had lost on an average over £10 an acre. The country consumed about four million tons of potatoes a year: 400,000 tons had this year been imported, and our home crop was over 3½ million tons. We had now on hand more potatoes than we could consume. Last August the Government placed a tariff of £1 a ton on foreign potatoes. A duty of 30s. instead of £1 would improve the financial position of the growers, inasmuch as the banks could be sure that if the price rose the country would not be flooded with foreign potatoes. *Col. P. J. House, T.D. (Hants.)*, seconded the motion. *Mr. Walter Smith*, on a point of order, asked whether the Standing Committee had any authority to approach the Tariffs Advisory Committee. *The Chairman* agreed with *Mr. Smith* that the Standing Committee had really no locus with the Committee, and that it was the growers who should make representations. He ruled then that the resolution was not strictly in order. It was, therefore, dropped.

Meat Quotas.—*Mr. Christopher Turnor* moved the following resolution :—

“ That this Council welcomes the action taken by the Government to control the volume of meat imports, and is of the opinion that it is only by adequate quantitative control, adjusted to the glut periods in home production, that the live stock farmer can be reasonably protected.

“ For this reason the Council urges the use of the quota system as the most effective way in which to organize our sources of food supply and to relate imports to home production.”

The resolution was duly seconded and discussed, *Mr. Gardner, Col. House* and others joining in the debate. It was put to the meeting and carried.

Pigs and Pig Products Reorganization Commission.—Mr.

Thomas moved the following resolution :—

“ That this Council respectfully requests His Majesty's Government to put the recommendations of the Bacon Reorganization Commission into effect on April 1 instead of July 1, if that course is possible.”

It was duly seconded, put to the meeting and carried.

The proceedings then terminated.

APPENDIX I

Report from the Standing Committee of the Council of Agriculture for England on the subject of the Interim and Final Reports of the Central Landowners' Association on Agricultural Policy.

The Central Landowners' Association in January of this year submitted to the Ministry of Agriculture certain recommendations for adoption as the Government's agricultural policy in view of the national financial and economic crisis. Later in the year—in May last—the Association submitted a Final Report. Taken together, the Reports are undoubtedly important agricultural documents, and the Committee thinks it well to bring the substance of them to the notice of the Council of Agriculture. In doing so, it has taken the opportunity of commenting on certain suggestions of special importance so that the Council, in receiving this Report, may deal with them also and, if and where thought desirable, give them added weight.

The Association has a membership of over 10,000 owners of large and small estates. It computes that two-thirds of the capital invested in the agricultural industry to-day is put up by owners, and that owner-occupiers farm one-third of the total cultivated area of the country. At the outset of the Interim Report (January, 1932), it suggests that in the national crisis (still now existing) it is necessary to effect an immediate and considerable increase in the production of home-grown foodstuffs and to increase employment in the agricultural industry. It recognizes that reduction in the volume of imported foodstuffs is a vital factor in restoring the national balance of trade in our favour. Above all, however, the Report regards it as necessary that the home producer should find in his wholesale selling price a reasonable margin of profit, and it puts it as the Government's first duty to assist this object by means of tariffs, quotas, or control of imports.

The Interim Report then proceeded to make recommendations for a wheat quota, the principle of which had since been embodied in legislation, and it approved the horticultural products emergency customs duties. It suggested, also, a reduction in the duty on beer and the imposition of a tax on foreign malting barley. It recommended also that the dumping of bounty-fed imports of oats should be stopped and a duty placed on foreign manufactured oat products, with free importation from the Empire.

Other recommendations dealt with sugar-beet, potatoes (main crop), milk and dairy products, beef and mutton, bacon and ham, eggs, fruit, jam and fruit pulp, the setting up of an imports authority, agricultural credit, and death duties on agricultural land. An appendix contained a valuable sub-report on the country's monetary policy.

In the Final Report the Association dealt again with death duties and sugar-beet, and on its proposals in these respects we propose to comment later in this Report. It also dealt more fully with other

important items such as the regulation of imports and organized marketing, land drainage rates, land tax, land settlement, agricultural education, rural transport, electricity supply, telephone facilities and development of rural industries. Members desiring to have details of these are invited to apply to the Secretary for a copy of the pamphlet, issued by the Association, containing both Reports.

While not agreeing in every detail with all the suggestions put forward by the Association, the Standing Committee considers that the majority of them are valuable and entitled to very close and careful consideration where this has not already been given by the Government. The situations in regard both to the milk and dairy industry and to the pig and bacon industry are now being actively dealt with. It is understood that a scheme dealing with the organization of the marketing of the home-grown crop of potatoes is before the Ministry for consideration in connexion with the Minister's powers under the Agricultural Marketing Act, 1931, whilst fresh duties have already been levied on potatoes from abroad (see separate Report). The Council has itself pressed upon the Government very strongly the desirability of dealing with the beef and mutton situation, and the Committee gathers that serious and earnest attention is being given to the over-riding question of the home agricultural policy in this regard in connexion with the decisions for meat quotas reached at the Ottawa Conference.

As regards agricultural education, the Standing Committee refrains from commenting upon the suggestions put forward by the Association, as it proposes at a later date itself to submit a separate Report to the Council on this question in connexion with which the Association's views will be considered. The changes in method and in policy governing agricultural education are not at the moment so pressing as other important matters, and the Standing Committee, therefore, reserves its Report.

The other two matters as to which the Committee wishes to offer certain comments are: (1) on the policy as regards sugar-beet; and (2) on the policy governing the imposition of death duties.

Taking death duties first, the present position as set forth in the Association's Report frequently presses with very great severity on agricultural properties. The principle of the incidence of the duty also makes that incidence very uncertain as well, and it may easily happen that a large estate becomes liable to death duty twice, or even three times, in ten years, and the duty may, in such circumstances, easily lead to an estate being almost entirely wiped out—sold to pay the duties—in a decennium. The Committee agrees with the Central Landowners' Association that, at the very least, a change of method of levy is required. To do real and full justice in the matter, the duty ought, probably, to be very much reduced for agricultural land, if it is not altogether abolished, and some other means of providing the two or three million per annum which it produces from agricultural estates discovered to take its place. We consider that it is contrary to the public interest that so large an amount of capital value should be taken annually from agricultural estates, which, even without the incidence of duty, would be starved of the capital needed for the successful continuance of the industry.

The suggestion of the Central Landowners' Association is that estate duty should be based on the actual average net income, upon which income tax is ultimately paid, instead of on the presumed market value of the estate if sold in the open market. If it were decided to implement this suggestion a large legislative change would be involved, and much careful consideration would require to be given to several important aspects of the matter. Altogether, the questions

involved are so wide, and the probability, on examination, of an alteration in the whole system of levying the duty on all kinds of property so likely to be found just and desirable, that the Committee hesitate at the moment to make any stronger suggestion than that the matter should be examined by a committee, or commission, with a view to amendment in the public and the agricultural interests as soon as possible.

As regards sugar beet, the Central Landowners' Association suggests that the subsidy, which comes to an end in 1934, should be abolished and compensated for by all imported sugar bearing a correspondingly higher duty, with a preference for supplies of overseas-Empire origin. We have considered this matter, and have come to the conclusion that, on the whole, the suggestion appears to be on the right lines. The subsidy may be said to have put the industry on its feet, not only in regard to production, but in regard to the factory treatment of the beet for the extraction of the sugar. It is not, however, anticipated that sugar beet culture in the country would, or should, require a permanent subsidy. Thus, the amount of sugar obtained per acre is capable of increase if Continental results are a safe comparison, and farmers in this country may well now apply themselves wholeheartedly to improvement in this respect. If, as appears to be the case, however, sugar can be imported from Empire and foreign countries and bought at lower prices than it is possible to sell home-grown sugar economically, then the question should, we submit, be dealt with, as the Central Landowners' Association suggests, by means of import duties, and, as we suggest, possibly also by quotas.

The position is by no means simple, however, as foreign and Empire sugars consumed here are mostly refined at certain ports in this country, whilst home-grown sugars are refined, as to about half the output, at the beet sugar factories. There are thus three parties whose interests have to be considered: the refiners of foreign and Empire sugars, the beet sugar factories, and the sugar beet growers.

Apart, then, from agreeing with the Central Landowners' Association's main suggestion as to duty, with preference for Empire countries, the Committee thinks that the way to a permanent solution of the sugar beet problems, now at a critical stage, is to have this somewhat complex question carefully examined, in the first instance, by a special committee of independent persons who might be asked to make detailed suggestions as to the amounts of duties and/or quotas required, with recommendations of any other steps necessary to give the maximum help to secure the full continuance of sugar production and refining in this country.

November 17, 1932.

APPENDIX II

Report by the Standing Committee of the Council of Agriculture for England on the subject of the Purity of the Milk Supply.

(1) The Standing Committee has had its attention drawn to the difficult situation which has arisen in regard to the purity of the milk supply. Questions of costs and prices are more usually in the minds of farmers and distributors, but those are directly connected with the problem of the demand for milk, and this depends very much on the public confidence in the purity of the supply. As to the value of fresh milk of good quality, there is no doubt. It is the best and cheapest food there is.

(2) Attention has been called by the Medical Officers of Health and Sanitary Officers up and down the country to the continued existence of cows giving tuberculous milk in a small minority of dairy

herds. This happens in spite of the Tuberculosis Order, 1925, of the Ministry of Agriculture, and the Milk and Dairies Acts and Orders, administered by the Ministry of Health and the Local Authorities. The Tuberculosis Order requires the Local Authority to slaughter and pay compensation out of State funds for cows which are found to be suffering from tuberculosis with emaciation or tuberculosis of the udder or chronic cough with definite clinical signs of tuberculosis. The Acts and Orders require all cowsheds to be cleansed and white-washed, and to be constructed in a manner which is hygienic from the point of view of the health of the cow, and requires the Medical Officers of Health of receiving districts to report tubercle bacilli in milk, and the Medical Officers of Health of sending districts to arrange for the veterinary inspection of animals with a view to the location and slaughter in proper cases of infected cows under the Tuberculosis Order, 1925. Further, the Milk and Dairies Order, 1926, lays it down that "Every county council and county borough council shall cause to be made such inspections of cattle as may be necessary and proper for the purposes of the Act and of this Order."

(3) It is estimated that at the present time somewhere about 3 per 1,000 cows in the herds of the country give tuberculous milk. These must be slaughtered under the Tuberculosis Order immediately their presence in herds is detected. The detection of these animals, however, is by no means a simple matter, for although cows showing marked signs of udder disease may be observed and reported by their owners, it is often the case that tuberculous udders can only be detected clinically by veterinary officers who have had special training and experience. Also, in a small proportion of cases, tuberculous milk is obtained from cows showing no clinical abnormalities of the udder. It is only possible to find such cases by bulk sampling of milk followed by individual sampling.

(4) It may be useful here to describe briefly the methods in operation in various counties for dealing with tuberculous milk under the Acts and Orders. Apart from the sampling done by Medical Officers of Health under Section 4 of the Milk and Dairies (Consolidation) Act, 1915, and the subsequent inspection by a veterinary inspector with a view to the detection of the responsible animal, or animals, in cases where tuberculosis is found, there is the periodical routine veterinary inspection under Article 8 of the Milk and Dairies Order, 1926, which is, however, optional in England and Wales, but compulsory in Scotland under the relative Scottish Order. The Ministry of Health, in a circular letter addressed to Local Authorities in England and Wales on January 20, 1927, stated that "the Minister's view is that the minimum which could be regarded as satisfying the requirements of Article 8 of the Order would be such inspections as are necessary for the purposes of Sections 3 and 4 of the Act, and for investigating cases where some definite cause of suspicion exists, such as discovery of tubercle bacilli in a sample of milk." Sections 3 and 4 of the Act give powers to stop the supply of milk likely to cause tuberculosis, and place upon Medical Officers of Health the duty of causing the cows in suspected dairies to be inspected.

(5) In England and Wales, therefore, it is left more or less to the discretion of Local Authorities to call for routine inspections, and the Order of 1926 is carried out in varying degrees of efficiency, or, rather, activity, according as reason to suspect the existence of tuberculous milk emerges in greater or less degree. A few local authorities have established a strong and efficient staff of whole-time veterinary inspectors, who inspect all dairy cattle in their area at least once, and sometimes as frequently as four times, a year. In these counties the milk of suspected cows, where complete proof is needed, is subject

to a microscopic test, which usually gives an immediate diagnosis in a positive case. Other local authorities have set up periodical inspections by a panel of part-time veterinary inspectors. Most, however, do not arrange for any routine inspection at all. In this latter group of counties the biological testing of bulk samples under the instruction of the Medical Officer as referred to above is the only means employed by the local authority in the search after tuberculous milk. Bulk samples, unlike samples from individual cows, very rarely yield positive results to a microscopic test. This is owing to the inevitable dilution of tuberculous milk through being bulked, and it is necessary in such cases to resort to a biological test, which takes five or six weeks before it gives results. The great disadvantage of this method is, of course, the long delay involved. By the time results are known the offending cow in a herd whose milk is sampled may easily have been removed to another herd, or sold for slaughter. Moreover, a cow, in certain stages of the disease, sometimes gives tuberculous milk intermittently, and mere periodic examination of bulk milk may miss the occasion when tubercle is present, or, again, a cow usually giving tuberculous milk may have gone dry at the times when the bulk is tested. In one county, at least, a combination of the two methods—of routine inspection on the one hand and bulk sampling on the other—is carried out, the whole-time staff making routine inspections in one district with microscopic tests, whilst bulk sampling and biological tests upon it go forward in the remainder of the county.

(6) It is abundantly proved that the maximum advance so far obtained is made in the few counties where periodical inspection of dairy herds by whole-time veterinary officers, from two to four times a year, is in operation. Where part-time veterinary officers are employed by a local authority the results are poor.

(7) Over and above these varying methods of attack on the problem by local authorities, it is always the duty of the farmer to report suspicious cases in his herd. This duty weighs more heavily upon him in a county where no routine inspection exists than in the others, and the Committee do not think that it is sufficient precaution to take against tuberculosis—merely to leave it to the chance of the farmer reporting it—nor is it fair on the farmer. The search for cows giving tuberculous milk should not be left to him, but should be placed in skilled hands.

(8) In view of these facts it appears that the method which should be adopted in all counties is for every dairy herd to be inspected by a full-time veterinary surgeon from two to four times a year, or, taking all cows in milk into consideration, three times a year on the average. The cost of this inspection should be borne by the local authority or the State or both. The veterinary staff employed for this purpose should be available to deal with all other county veterinary services, including work under the Diseases of Animals Acts. Foot-and-Mouth Disease, Swine Fever and the importation of animals are already dealt with directly by the Central Veterinary Staff of the Ministry of Agriculture, and it would certainly seem to be likely to be more economical and efficient if the whole work of animal disease and tuberculosis inspection were controlled under one central head—in other words, were performed as a State Veterinary Service.

(9) This may seem a counsel of perfection when there is a need to curtail expenditure in both State and local services, and in any case the establishment of a complete State Veterinary Service could not be accomplished rapidly. A properly organized State Service, however, should be cheaper, and should conduce to greater uniformity of action, and therefore to greater efficiency than an aggregation of whole-time veterinary staffs under local authorities, which would still call for

the present central veterinary staff of the Ministry to carry out the special duties it is found necessary for them to undertake. The Committee considers that this matter is one of the greatest importance and should be taken in hand without delay. It might be necessary, in addition to that service, to employ part-time veterinary surgeons for certain more routine duties in regard to diseases, and also to retain sanitary officers to do the work of sanitary inspection of cow-houses and buildings in collaboration with the whole-time veterinary officers.

(10) As an instance of the cost of an up-to-date County Veterinary Department, working on the lines suggested for a State Service, the West Riding's figures of the cost of a full-time staff, etc., may be quoted. The salaries and travelling expenses of its Chief Veterinary Officer and eight assistant full-time Officers amount to about £7,000 (C.V.O. £750 \times 25 \times 900 and Assistants £400 \times 25 \times 600). In addition, about £550 is expended on part-time veterinary surgeons employed for sheep scab work and about £700 on clerical expenses and others required to cover National Health Insurance, equipment and drugs, superannuation charges, and miscellaneous. Altogether, the entire service costs the West Riding about £8,250, of which £550 is for part-time veterinary work, leaving £7,700 for the full-time staff and clerical and other expenses. It is estimated that the diseases of animals work, including work definitely to be assigned to the Tuberculosis Order, accounts for almost exactly one-half of this total, whilst the other half is paid for inspection of cows and milk as an item of public health work. Under this second head come all expenses for routine inspection of dairy cows for investigating tuberculous milk complaints under the Milk and Dairies (Consolidation) Act. There are approximately 100,000 cows on the registered farms in the area, and in 1931 upwards of 175,000 clinical examinations were carried out. The cost works out at 9½d. per cow per year, or 5½d. per clinical examination. If the whole cost of the service, including diseases of animals work, is calculated, it becomes 1s. 7d. and 10½d. respectively. If routine inspection is to be increased to three times a year as recommended above, it is estimated that four additional whole-time veterinary inspectors would be needed. The number of tuberculous milk and udder cases discovered in this county in 1931 was 411, i.e., about 0.4 per cent., of which 280 were brought to light through the routine inspections of the whole-time veterinary staff. Comparing this figure with the results of only the farmer-reports plus occasional bulk sampling, in the group of 33 counties in which there is no routine inspection of cows, the percentage in the same year was 0.11, whilst in the 8 counties in which there was routine inspection by part-time officers the percentage was only 0.06.

(11) It should be noted also that, since the routine inspections by a full-time veterinary staff in Yorks W.R. began in November-December, 1927, for one-half the county, and October, 1928, for the other half, the increase in the number of cows dealt with under the Tuberculosis Order has been very marked, particularly those suffering from tuberculosis of the udder and from chronic cough showing definite clinical signs. The number of cows suffering from tuberculous emaciation and killed under the Order has been brought practically to zero. Other counties in which this kind of system of dealing with tuberculous cattle is either in operation or in process of construction are Durham, Cumberland, Yorks N.R., Surrey, Notts and Middlesex. As regards the number of inspections required per cow per annum, the statement of the Chief Veterinary Officer for Yorks W.R. is that "Experience has shown that the need for inspection varies according to the district and the type of farm and class of cows kept, and that while two visits

in the year may suffice for many of the butter-making farms on the hills, it is quite inadequate in the case of the milk-producing farms where older cows are milked . . . The value of the work cannot be judged only by the number of actually diseased animals dealt with . . . but even more by the moral effect it has in improving the general quality of the cattle." There is also the great educational effect, especially where the Inspectors are charged also with carrying out duties under the Diseases of Animals Act. Farmers have the benefit of observing the saving in live stock and money which arises from early diagnosis of disease. Also, a hint from the official Veterinary Inspector on a point of appearance and health of an animal, and the farmer's own veterinary adviser is called in, with the result, perhaps, that an animal's life is saved. This is quite apart from discussions of such matters as sanitation and hygiene, advice on which farmers very much appreciate.

(12) Taking a broad view of the situation over the country, the Committee agrees that it may very well be that in some counties there is much less tuberculosis present in dairy herds than in others, but it thinks that no local authority should be satisfied that this is the case in their own area without the most careful investigation by their officers. There is, however, one thing certain, and that is that unless farmers and local authorities take speedy steps to clear all milk from the likelihood of tuberculosis contamination, more and more will become pasteurized. Efficient pasteurization is usually only able to be performed by the large milk distributing concerns (except where groups of dairy farmers combine for the purpose of running a proper pasteurizing unit for all their milk) and the business of milk distribution may be expected in such circumstances to tend to pass more and more into their hands. Is this desirable? The public requires clean and pure milk. It can get such milk as well direct from the farms through the farmer, producer-retailer and smaller retailer. For the farmer, producer-retailer or smaller retailer fully to defend this claim, however, it is essential that the herds giving the milk sold raw should be free, and guaranteed free, from any tuberculous infection. The Committee therefore, recommends that the policy which many farmers have already adopted of building up tubercle-free herds should be greatly encouraged. It suggests that herds which are found on official testing with tuberculin to have been made tubercle-free should be certified by the State to be such. This certificate would be of value in securing the best available prices for fresh milk (which would not need pasteurization) and for other dairy products, as well as for calves and stock tubercle-free, and might also be of advantage when animals from the herd were purchased by colonial and foreign buyers for the reinvigorating or establishment of dairy herds overseas.

(13) The Committee considers that such a policy of cleaning up the milk supply immeasurably superior, as a national policy, to one which is heading more and more for total pasteurization. Milk should be produced clean and sound and sold raw rather than produced with less care and have to be pasteurized or sterilized—some of its character being taken away in the process—in order to make it "safe."

(14) The cost of a whole-time veterinary staff to make the necessary inspections and to weed out animals giving tuberculous milk would not be too high a price to pay for the results which would accrue.

(15) If the West Riding figures are taken as a guide, and the cost in that county put at about £8,000 for dealing with a cow and heifer population of 100,000, on the basis of rather less than two inspections on the average per annum (exclusive of part-time veterinary help), then for the 3,000,000 cow and heifer population in England, Wales

and Scotland, which is the approximate figure at which animals in milk and therefore liable to be examined at any one time may be put, the cost would be in the region of £360,000 on the basis of three inspections on the average per annum. The total cost of a scheme would not, of course, be all fresh money to be found. A large sum is at present spent by the State and local authorities on the joint objects of reducing tuberculosis and animal disease, some of which is wasteful expenditure, inasmuch as the work is not properly co-ordinated. But clearly, much careful consideration would require to be given in working out the details of a scheme, whether it be a State scheme or a local authorities scheme. The value of the milk supply is about £55 million, and a scheme costing even up to £500,000 for Great Britain, or less than 1 per cent. of this total value, is not high, considering the benefit to be derived, not only in respect of the reduction of tubercle in milk and in dealing with all animal disease, but in the further enlightenment of the farmer on matters of veterinary hygiene and sanitation.

November 17, 1932.

APPENDIX III

Report from the Standing Committee of the Council of Agriculture for England on the Report of the Reorganization Commission for Pig and Pig Products.

(1) The Report in question is issued as No. 37 of the Economic Series of the Ministry of Agriculture and can be purchased by members of the Council, price 6d. net. From certain points of view, it may be regarded as the most important of any of the official reports relating to a branch of Agriculture that have been issued in modern times. The Reorganization Commission was set up jointly by the Minister of Agriculture and the Secretary of State for Scotland under Section 15 of the Agricultural Marketing Act, 1931, with the duty of preparing a scheme or schemes applicable to England and Scotland for regulating the marketing of pigs and any pig products. It was asked also to investigate (1) the extent to which such a scheme could be operated in co-operation with authorities administering a similar scheme in Northern Ireland, and (2) to explore the question of quantitative regulation of imports.

(2) As a result of its inquiries emerges for the first time in the history of the pig industry—or of any other industry of the kind in this country—besides a statement of all the essential facts of the industry as they exist in the country at present, a concise plan for dealing with the future of the industry on the basis of a limitation of the total supplies from all sources—Dominion, foreign and home-produced. The object of so new and drastic a step in this case is frankly stated to be to raise and stabilize wholesale prices so that it will become profitable for the home industry to reorganize itself—on lines indicated in the Report—with a view to a speedy recovery and maintenance of prosperity in the face of the grave difficulties caused by price cycles, due mainly to price changes in feeding stuffs and to waves of over- and under-production in all parts of the world.

(3) On this subject of price cycles, the Commission gave the following expression of opinion:—

“The pig-price cycle, which in all countries has been the curse of the pig industry, is, therefore, closely inter-related with the feeding-stuffs price cycle, but the exact nature of the inter-relation between the two cycles is uncertain. Since feeding-stuffs prices in the United Kingdom under present conditions are

determined by world prices, the cyclical changes in their general level are due chiefly to influences outside this country. At least in the United Kingdom, therefore, it is likely that the influence of the price of feeding stuffs on farmers' production policy—and hence on the price of pigs—has been much greater than the effect of pig supplies on the price of feeding stuffs.

"If, therefore, the pig industry in the United Kingdom is to be successfully developed, the influence of both pig and feed-price cycles upon farmers' policy must be removed or, at least, reduced; the real problem is how to persuade farmers to adopt a consistent production programme, properly adapted to the capacity of bacon factories and to consumers' demand.

"The first essential seems to us, therefore, to be that the supply of bacon marketed in the United Kingdom should be stabilized. This would encourage the planned and steady production of bacon pigs, both at home and ultimately in bacon exporting countries, and might lead to a general diminution of the cycle of supplies and price of pig meat.

"At least in the near future, however, it is likely that the pig cycle in the United Kingdom will continue in the pork-pig market, for which we have not in this report proposed any system of regulation. To protect the bacon industry from the effects of this cycle, it is necessary that the bacon-pig and pork-pig markets should be segregated, in order to reduce the diversion to the pork market, when pork prices are high, of pigs required by the bacon industry. We recommend measures to secure this segregation. If these are effected—and we fully realize the difficulty of the task—it remains to protect the bacon-pig industry from the effect of variations in feed prices."

(4) Turning now to the actual figures, the imports of bacon and hams in 1931 is stated in the Report at 11½ million cwt., a figure which exceeded the imports of 1930 by nearly 2 million cwt. During the present year the imports of bacon and hams have been very heavy (amounting, at the end of October, to 9½ million cwt.). The effect of these heavy imports has been to bring the price of bacon down to 14 per cent. below pre-war. The figure to which the Commission recommends that total supplies (both imported and home-produced) of bacon and hams should be limited for a period beginning July 1 next is 10,670,000 cwt. per annum, a reduction of 2½ million cwt., or 20 per cent. of the heavy supplies of 1931 (and the same per cent. of the 1932 figure—calculated on the proportion of ten months' import). The reduction proposed would not be so arbitrary and artificial as it might seem, however, because of the fact that already the Continental producer is finding no profit in existing prices, and herds are being cut down. The sow population of Denmark, for example, is stated to have been reduced during this year by over 20 per cent. of the 1931 figure.

(5) The object of limiting the home supply is to ensure to the bacon factories a definite number of pigs of the right quality. The producers would guarantee to supply these, and there would be definite contracts for both number and quality. All other pigs produced would be for the pork market, and supplies and prices of these would not be allowed to interfere with contract supplies and prices for bacon pigs. It follows that each bacon factory would have a due allowance of the home quota allotted to it. National quotas for various exporting countries would then be decided on. The home quota would be increased from time to time in order to allow for increases in the contracts held by British curers according as the home supply increased. Adjustments would then be made in the import quotas. It is not recommended,

however, that the rate of expansion should be left entirely to the industry, as there are evils likely to arise through too fast a growth. The limit proposed is that the industry should be allowed to double its output in $2\frac{1}{2}$ years.

(6) To carry out this programme much organization and co-operation of all interested parties are required. Full details of the course proposed by the Commission are given in the Report. There would, for example, be boards of pig producers and bacon curers under the Agricultural Marketing Act, 1931, and a joint representative organization, to be known as the "Pig Industry Development Board," which would be financed by both parties. The division of the total into the respective quotas would be the first business, and contract terms and prices would then have to be agreed. In order to give sufficient security to enable pig producers to enter into long-term contracts, the Commission propose that farmers should be guaranteed a minimum price based on a formula to be agreed between the boards of producers and curers, which would vary with the price of feeding stuffs.

(7) It is further proposed that the Pig Industry Development Board be furnished with powers which will enable the industry to carry out what are called "efficiency measures." For example, the consumer and the trade should be assured that the new supplies of home-produced bacon and hams that will be coming on to the market shall be of the right quality and type of pig, and produced at the minimum of cost, and steps should be taken to ensure this. The scrub boar would be eliminated, and a wide educational campaign in the technique of pig feeding and management undertaken. Research into breeding and marketing problems would also be planned, and there would be widely advocated the sale of all pigs on a grade-and-dead-weight basis, as is now in use under the National Mark Scheme in regard to farmers' consignments of cattle. The Commission also recommend the use of the National Mark in connexion with home-produced bacon and hams.

(8) One other suggestion of the Commission, that might be speedily acted upon is that a permanent Reorganization Commission be set up to deal with the orderly development of other branches of the industry of agriculture: a planning body for the agricultural industry as a whole. We heartily endorse this suggestion, as we think that the marketing of live stock and meat, both cattle and sheep, stands in even more need of organization than does the industry of pig production. Large-scale abattoirs to supply the larger centres of population would be involved in such a scheme, and these properly organized and administered would save much of the waste that now exists—as shown in previous Reports from this Committee to the Council—in the treatment of cattle and sheep in a large number of small slaughter-houses. If the producer is to be better paid for his essential services without the price being raised to the consumer, then economies in the wholesale marketing and treatment of fat cattle and sheep and meat must be made, and the producer admitted to a full share in the saving as is his due.

(9) In making this brief summary of the outstanding points of the Reorganization Commission's Report, for the benefit of members of the Council, the Standing Committee would suggest that the Council endorses the Standing Committee's view that the Reorganization Commission should be congratulated on their bold handling of the situation. Whilst the Report is, at present, no more than in the proposal stage, the Committee confidently hopes that early effect will be given to it. A long-sighted scheme for the reconstruction of a basic industry, proper planning for the future, and the retention, at any rate, of a good proportion of the home market for the home industry,

cannot prove other than a right and proper objective for constructive thought and action. The alternative of taking no care for the future of the industry means not merely stagnation, but decay.

(10) It must be remembered that the next effective step in bringing about the reorganization of pig production and marketing on the lines suggested in the Report lies with the producers themselves. The Standing Committee would, therefore, ask the Council to urge on farmers in England and Wales the necessity for considering, in conjunction with Scottish farmers, the draft scheme for a Pig Marketing Board prepared for pig producers by the Commission, and for the early presentation of such a scheme under the Agricultural Marketing Act to the Minister of Agriculture and the Secretary of State for Scotland. The Standing Committee also asks the Council to express a hope that the owners of bacon factories will proceed at once to present to the Ministers concerned the complementary scheme for the regulation of the marketing of home-produced bacon which is necessary to complete the plans for implementing the Commission's Report.

November 17, 1932.

APPENDIX IV

Report by the Standing Committee of the Council of Agriculture for England on the subject of the Dutch Auction System.

(1) At the last meeting of the Council, the Standing Committee was asked to consider the question of the use of the electric clock indicator system in auctions in Holland and elsewhere, and to report upon the possible advantage of the introduction of the system into this country.

(2) The Committee finds that the system is largely used, in Holland, for selling produce before it is graded and packed, and that it appears to be mainly suitable for selling agricultural produce for export. The essential thing about it is that the bidding starts at the highest point, and, in effect, only one bid is made for each lot. The indicator on the dial turns slowly downward, and when it reaches a point at which someone is prepared to buy the lot put up a button is pressed by the bidder and the indicator stops, the lot being booked to the person who presses the button.

(3) This system might conceivably be suitable for application in a few special cases in this country, but the Committee does not see that any advantage would accrue from recommending its adoption for auctioning agricultural commodities in general. Its operation does away with the element of competitive bids, and proceeds on the assumption that every potential buyer has made up his mind quite definitely what figure he is prepared to pay for any particular lot. Good prices are made by buyers meeting together and bidding against each other according to the strength of their desire to purchase. The case can be argued either way, but competitive strength appears to be better and more naturally shown in a system of competitive bids going up, than in the indication by any one buyer straight away of the highest to which he is prepared to go.

(4) In these circumstances, the Committee does not recommend that any special steps should be taken to facilitate the introduction of the Dutch system in this country. If, however, any set of conditions approximating to the Dutch conditions of selling produce prepared for large-scale business arises, such, for example, as the auctioning of large bulks of, say, standardized National Mark eggs in London and other large centres of population, then the system might be considered

again on the ground that it might save time and trouble in this country in the same way as it appears to do in Holland.

(5) The question of the improvement of our own auction systems by the real elimination of rings of buyers, usually at the smaller markets, is an entirely different question, with which the Committee is not at the moment concerned, bearing in mind the limits of the Council's reference.

November 17, 1932.

AGRICULTURAL RETURNS OF ENGLAND AND WALES, 1932*

PRODUCE OF CROPS

WITH the exception of wheat and potatoes, there was a decline in the acreage under each of the principal crops. Yields, however, were generally higher than in 1931, sufficiently so in the case of oats, mixed corn, turnips and swedes to counteract the smaller acreages. The estimated total production of barley, beans and peas, mangolds, and seeds and meadow hay is below that of 1931. With increased acreages and higher yields the estimated total production of wheat and potatoes is greater than last year by 15 per cent. and 35 per cent., respectively. Compared with the ten years' averages yields show a general improvement, but the average yield of wheat per acre, although better than last year, is just below the average of the past ten years and the same observation applies to mangolds. The yield of peas per acre is about $\frac{1}{2}$ cwt. below both the ten years' average and the yield in 1931.

Corn Crops : Wheat.—There were 91,000 more acres under wheat in 1932 than in the preceding year, and the yield per acre was 17·2 cwt. as compared with 16·1 cwt. in 1931. The total production this year is estimated at 22,092,000 cwt. or 2,862,000 cwt. more than last year, an increase of 15 per cent. Notwithstanding the increase of 1·1 cwt. per acre over the previous year, the yield of wheat over the whole country is ·1 cwt. below the ten years' average. In the principal wheat growing areas the yields are generally below average. In the Eastern and North-Eastern divisions the average yields for the year are ·6 cwt. and ·8 cwt. per acre, respectively below the divisional averages. On the other hand, in the West-Midland and South-Western divisions yields were nearly 1 cwt. per acre and in the Northern and South-Eastern divisions ·4 cwt. and ·2 cwt. per acre respectively above the ten years' average.

Barley.—The area under this crop was 69,000 acres smaller

* This return was published on December 15, 1932.

PRELIMINARY STATEMENT SHOWING THE ESTIMATED TOTAL PRODUCE AND YIELD PER ACRE OF THE CORN, HAY AND ROOT CROPS IN ENGLAND AND WALES IN 1932, WITH COMPARISONS FOR 1931, AND THE AVERAGE YIELD PER ACRE OF THE TEN YEARS 1922-31.

Crops	Estimated Total Produce		Acreage		Estimated Yield per Acre		
	1932	1931	1932	1931	1932	1931	Average of the ten yrs., 1922-31
	Thou- sands of cwt.	Thou- sands of cwt.	Acres	Acres	Cwt.	Cwt.	Cwt.
Wheat ..	22,092	19,230	1,287,908	1,196,607	17·2	16·1	17·3
Barley ..	15,842	15,457	960,530	1,029,141	16·0	15·0	15·6
Oats ..	25,018	24,786	1,580,010	1,651,606	15·8	15·0	14·9
Mixed Corn	1,841	1,688	113,640	121,069	16·2	13·9	15·0
Beans ..	2,363	2,403	138,555	144,953	17·1	16·6	16·3
Potatoes ..	893	1,046	65,767	74,913	13·6	14·0	14·2
	Thou- sands of tons	Thou- sands of tons					
Seed's Hay*	2,176	2,608	1,538,265	1,726,444	28·3	30·2	28·1
Meadow Hay† ..	4,662	5,317	4,546,685	4,777,843	20·5	22·3	20·5
					Tons	Tons	Tons
Potatoes ..	3,308	2,454	504,275	446,772	6·6	5·5	6·3
Turnips & Swedes	7,535	6,978	578,047	618,753	13·0	11·3	12·6
Mangolds	4,336	4,529	229,164	269,665	18·9	16·8	19·1

* Hay from Clover, Sainfoin and Grasses under rotation.

† Hay from Permanent Grass.

than in 1931, and although at 16 cwt. per acre the yield for the whole country was 1 cwt. higher than last year, the estimated total production of 15,342,000 cwt. is 115,000 cwt. less than in 1931, a decline of a little under 1 per cent. The yield was ·4 cwt. above the ten years' average. With the exception of the North-Eastern division, where the yield was ·3 cwt. below the ten years' average for the division, the yields throughout the country were in the main above average.

Oats.—The yield per acre of oats for the whole country was ·8 cwt. above the yield for the previous year, and whilst the improvement in the yield was not quite so marked as in the case of barley, it was more than sufficient to counterbalance the reduction in the area under the crop, and the total production is estimated to be 232,000 cwt. higher than in 1931, an increase equivalent to nearly 1 per cent. Improved yields were obtained in all except nine counties.

Mixed Corn.—The acreage under mixed corn was reduced from 121,069 acres in 1931 to 113,640 acres, but the yield rose from 13·9 cwt. per acre to 16·2 cwt. per acre, and the total estimated production of 1,841,000 cwt. is 153,000 cwt. or 9 per cent. higher than last year. The yield per acre is 1·2 cwt. above the average for the past ten years.

Beans.—At 17·1 cwt. per acre the yield of beans harvested as corn shows an increase of ·8 cwt. per acre over the ten years' average and is ·5 cwt. higher than the yield in 1931. The acreage under the crop, however, was reduced from 144,953 acres in 1931 to 138,555 acres and the estimated production, amounting to 2,363,000 cwt. as compared with 2,403,000 cwt. in 1931, shows a fall of about 2 per cent. The improvement in the yield was in evidence in every division.

Peas.—Peas harvested as corn were grown on 9,146 acres fewer than in 1931, and the yield fell from 14 cwt. per acre to 13·6 cwt. per acre. The total production, estimated at 893,000 cwt., is as much as 153,000 cwt. or nearly 15 per cent. less than last year. The yield is ·6 cwt. below the average for the past ten years.

Hay.—The ideal conditions which prevailed during the early stages of the hay harvest were followed by a spell of very unfavourable weather in July, but a subsequent improvement in the weather enabled the carting and stacking of hay, even in the later districts, to be generally completed by the end of August under favourable conditions.

Seeds Hay.—The yield of seeds hay was slightly above the average of the past ten years, but 1·9 cwt. per acre below the yield in 1931. The crop also was taken from a smaller acreage, and the estimated production of 2,176,000 tons is 432,000 tons or nearly 17 per cent. less than the crop last year. Whilst over the remainder of the country yields were generally above the ten years' average, in the South-West and in the North and North-West and in Wales they were generally below the average.

Meadow Hay.—The production of meadow hay is estimated at 4,662,000 tons as compared with 5,317,000 tons in 1931, a difference equivalent to a 12 per cent. reduction. The yield of 20·5 cwt. per acre was about average, but was 1·8 cwt. per acre below that of the previous year, while the acreage of permanent grass from which a crop of hay was taken in 1932 was 231,000 acres smaller than the area from which the crop

was taken in 1931. As in the case of seeds hay the yields on the Western side of the country were generally below the ten years' average.

Potatoes.—The increase of 22,000 acres in the area under potatoes in 1931 was followed by a further increase of 57,500 acres in the current year, the crop being grown on 504,275 acres in 1932 as compared with 446,772 acres in 1931. With a more favourable season than last year the yield was 6·6 tons to the acre as compared with 5·5 tons in 1931 and was ·3 tons per acre higher than the ten years' average. The total production is estimated at 3,308,000 tons as compared with 2,454,000 tons last year, or 228,000 tons above the average total production for the past ten years. With the exception of the North-Eastern division yields were generally higher than the ten years' averages.

Roots : Turnips and Swedes.—The yield of turnips and swedes, which is estimated at 13 tons to the acre, is 1·7 tons per acre higher than last year's yield and is ·4 tons ~~per~~ acre above the ten years' average. The acreage under the crop in 1932 was only 578,047 acres as compared with 618,753 acres in 1931, but the improvement in the yield was sufficient to give an estimated total production of 7,535,000 tons or 557,000 tons more than last year, an increase equivalent to 8 per cent. In every division in England except the North-Eastern the yield was above the ten years' average for the division.

Mangolds.—Although the yield of mangolds was 2·1 tons to the acre higher than the yield last year the improvement was not great enough to counterbalance the decline in acreage of 40,500 acres, and the total estimated production of 4,336,000 tons is 193,000 tons below the production in 1931, a drop of 4 per cent. The yield of 18·9 tons to the acre was ·2 tons below the ten years' average and only in the Eastern, Northern, South-Western divisions and North Wales was the yield above the divisional average.

Sugar-Beet.—The area under sugar-beet was 254,983 acres as compared with 233,219 acres in 1931. The season was not unfavourable and the estimated yield of 8·4 tons to the acre is 1·3 tons above the yield of last year. The improvement in the yield was fairly general. It is estimated that the total production of washed and topped beets will be over two million tons.

JANUARY ON THE FARM

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THE advent of a new year does not materially alter the day-to-day work on the farm. Work done this month is much the same as that done in December. The gradual lengthening of daylight brings new hopes, and thoughtful consideration as to what the season will bring.

In late years the greatest anxiety of the farmer has been the question of prices; weather, progress of crops, thriving of stock have been secondary matters. The economic situation has dominated his thoughts, and the fall in prices has been so rapid and extensive that all efforts to adjust costs of production to the lower levels of prices have been ineffective, and margins of profit have in very many instances completely disappeared.

Regular readers of these notes may be excused if they are sometimes a little impatient with descriptions of what should be done to ensure good crops and prolific and thriving live stock, when they know full well that the best known practice will fail to give fair remuneration at the prices prevailing in recent months. These matters, however, are constantly in mind; advice that is not based on sound economics is valueless to any primary producer of commodities that have not a monopoly value.

Labour in Winter.—British farming provides a fairly uniform distribution of labour throughout the year. There is pressure at times, and there are periods when work is less pressing—when a job not done to-day may be done to-morrow.

In arable farming, weather conditions so materially affect the progress of the work at seed-time and harvest that advantage must be taken of favourable spells to secure the best results. In general, however, the need for increased labour to deal with these operations has been largely lessened in the present century by the greater number and greater efficiency of the machines available, particularly for hay-making and harvesting.

It is not unusual for a farm to maintain a regular staff throughout the year and employ no casual labour. Farms on which there is a comparatively large proportion of grass land to arable, and where no considerable area of potatoes or root crops is grown, have little need of casual labour. On dairy

farms the need for labour is fairly constant, and in contrast with arable farms the winter period involves more labour than the summer period.

Socially it is desirable that workers should have assured employment throughout the year, and the practice of mixed farming, which is a feature of farming in these islands, is commendable in this respect.

On purely arable farms or farms mainly arable, where potatoes, sugar-beet, or other root crops are grown in large amount, or where fruit and hops are a feature of the activities of a district, seasonal labour is required. Under such conditions it is uneconomic to attempt to carry on throughout the year with a whole-time staff only. This problem does not get easier, and if the arable, the fruit-growing and market-garden acreages increase it will become more acute.

There are, however, jobs that are essentially winter jobs—hedging and ditching, making and repair of farm roads, fencing and other matters—that must be done if the farms are to be maintained in a state of full efficiency. The attention given to such work is usually a reflection of the economic position of the industry and of the individual farmer. Years of depression tend to an accumulation of what are usually termed dilapidations. The effect of these on the productivity of the land may be small at first, but sooner or later a time of reckoning will come when the work must be done at much greater cost or the productivity of the land will be permanently lowered.

Size and Shape of Fields.—Nothing is more striking to visitors from the New World, or from the more recently settled countries like Australia, than the lay-out of the fields. They are astonished at the time and money that have been expended in creating so many enclosures, and in planting and caring for so many hedges or other fences. Some districts, e.g., parts of Devonshire, are notable for small enclosures. Mr. Grant, of Exeter, writing in 1844 in the *Journal of the Royal Agricultural Society of England*, estimated that within an area of 37,000 acres there existed 1,651 miles of fences, occupying 2,642 acres—or $7\frac{1}{2}$ per cent. of the whole. The average size of the fields he found to be just over $4\frac{1}{2}$ acres.

Need of shelter has often been urged as the reason for so many small enclosures, but curiously enough the place where small fields are so plentiful are usually the lowland and more sheltered valleys. Up to a point, moderate-sized fields are

advantageous, especially when under grass and grazed by live stock that benefit from the shelter and shade afforded.

Where shade and shelter are a feature, arable crops are difficult to secure at harvest, while even haymaking is much handicapped. Another drawback to too many boundaries, especially hedge boundaries, is that they provide shelter for birds that do much damage to corn crops, and vermin (e.g., rats and rabbits) that destroy both grass and arable crops.

One advantage of small fields is that they allow of controlled grazing, the importance of which is being increasingly appreciated.

There should, however, be moderation in the size of the fields. It may be true to say that 50 acres in five enclosures is better than 60 acres in one enclosure, as far as livestock grazing is concerned. On the other hand, fields of two or three acres with hedges in between can hardly be justified on any moderate-sized farm. Where it is decided to clear a hedge and fill in a ditch, due consideration should be given to the question of drainage, so that the land will not be adversely affected. In many situations the ditch is essential to the drainage of the fields, and where this is so a pipe drain should take its place.

Whatever be the dimensions adopted for the enclosures the provision of a water supply is of prime importance. The shape of the fields must often be modified to provide access to water. Straight-line boundary fences should always be adopted when new fields are laid out, as they facilitate cultural operations. A revised lay-out of the fields on a farm is rarely a practical proposition, but modifications can often be made with advantage. Great areas of arable land have been converted to pasture. Many of the fields are large, and whilst they were cultivated as arable land, and the live stock was confined to folded sheep, fences were unnecessary. Now that they are under grass smaller fields may be desirable, and it is worth serious consideration whether, in many parts of the country, this new grass should not be laid out and fenced so as to permit arable cultivation and temporary pastures to be combined in a long rotation, and thus provide for both livestock and arable farming to be practised in eastern and southern districts in much the same way as it has long been practised in the west and north.

It is not without significance that there is a continual migration of farmers from west to east and from north to south. The better knowledge now available on the provision of

temporary pasture in the drier districts can do much to alter the practice in districts where a particular field is now either permanent pasture or continually under cultivation.

Hedges.—It is a matter for very great regret that the hedges of the country generally are in such poor condition ; some are quite worn out and others deteriorating rapidly. It is not an economy to neglect the hedges and find after a time that gaps have to be made up with all sorts of makeshift materials that wear out in turn. In the long run the maintenance of the hedge may be the best economy. A badly-neglected hedge is difficult to reclaim, but where there is a fair proportion of thorn much good can be done by grubbing out any elder bushes or quick-growing woods so that, when layered, the thorn has a good chance to succeed. In layering it is important when bending the thorn over to cut close to the ground. The stool should be trimmed with an upward stroke, the cutting should be clean, and there should be no hollow places to hold water. Ragged edges retard healing and inhibit growth.

Many hedges are spoiled by lack of care in the years after they have been layered. The young shoots are readily nibbled by stock, and whilst one side is fairly protected by the ditch it is advisable to protect the other side for two or three years. Once a good, thick growth has been established the hedge will protect itself.

A watch should be kept on the hedge, and plants such as elder, bramble, briar, bryony, woody nightshade and wild hop should be grubbed out, as they are often the cause of rapid deterioration of the more valuable hedge plants. Every endeavour should be made to promote growth at the bottom of the hedge, so that it should be wider at the bottom than at the top and have the shape of a capital A.

Ditches.—Neglect of hedges is bad and often involves increased outlay to provide fencing, but neglect of ditches is very much worse, soon causing such deterioration of land that the yield of arable land crops is reduced and the quality of grass land is lowered. No operation is more essential to the improvement of many classes of land than draining. Without good drainage, either natural or artificial, good farming is impossible. Where the land is water-logged, manures cannot have their full effect and the soil cannot be brought into a good physical condition for the growth of crops. For

nearly a century, periods of comparative prosperity have been accompanied by improvements in drainage, and many thousands of acres have been thus reclaimed. Any artificial system of drainage requires maintenance if it is to continue to function satisfactorily. Open ditches, particularly those in fields where cattle are grazed, are very apt to deteriorate, particularly where they are comparatively shallow, level, or dry in summer. Constantly flowing streams do not block up so rapidly as those that only flow in the winter and are almost or completely dry during part of the summer.

Ditches need cleaning out annually, and where they are shallow and apt to be trodden in by cattle it may be well worth while to consider the erection of a light fence to keep the cattle from treading in the sides. The sides should not be too straight. The exact angle will depend on the nature of the soil; the stiffer the soil the steeper the sides may be. It is important to keep the ditch down to a depth below the outlet of any field pipes.

In the past, a good deal of pipe draining has been done, of which no record exists; very often it was of a patchy character to dry a particular portion of a field and it is not unusual for pipe outlets to be discovered in all sorts of unlikely places. Unless the outlets are kept clear the drainage cannot be effective. Apart from the question of pipe outlets a deep open ditch is much more effective for drainage purposes than a shallow one.

Generally speaking, over large areas of the country the position and depth of the original ditches was designed with considerable wisdom and forethought, and if maintained in their original condition, such ditches would be very effective.

It is not only on arable land that ditches should be cleaned out each year; it is equally necessary on grass land, for although the damage in the latter case may be less apparent it, nevertheless, exists, and if bad drainage is not corrected a change in the nature of the grass will take place, and will persist for a time after the cause has been removed.

NOTES ON MANURES

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Artificial with and without Dung.—It is interesting to compare the effects of artificials on yield when used alone, and when used in conjunction with farmyard manure. On general grounds one would expect that since dung raises the level of cropping and provides a good supply of plant nutrients, the increases produced by artificials at this higher level would be rather less than when used alone. On the other hand it might be claimed that since farmyard manure renders the soil a better physical medium for plant growth, the crop might make even better use of further quick-acting fertilizers when dung is also supplied. Moreover, dung, by supplying available potash, may improve the effect of added nitrogen on a potash-deficient soil, and similarly for the other nutrients.

The following results of field trials will enable farmers to form some judgment on these points, although the experiments were not designed for this purpose, and more modern plot arrangements would permit of a closer comparison.

The Potash Effect.—Here the evidence all points one way. Dung is such an excellent potassic fertilizer that much of the potash requirement of the crop is met by the manure; and the extra result produced by potassic fertilizers, although quite marked, is less than is produced in the absence of dung.

Potash Effect with and without Dung

Potatoes : Cwt. per acre increase per 1 cwt. Sulphate of Potash or its equivalent

				With dung	No dung
<i>Rothamsted</i> , 1921	..	..	..	2	25
1922	..	..	..	17	54
1923	..	..	..	6	29
1924	..	..	..	2	15
				—	—
Mean	..	..	..	6	31
				—	—

Seale Hayne, 1927 :—

No nitrogen in basal dressing	..	..	6	9
1 cwt. Sul. Amm. in basal dressing	..	..	7	12
2 „ „ „ „	..	..	3	27
3 „ „ „ „	..	..	9	23
			—	—
Mean	..	..	6	18
			—	—

The Nitrogen Effect.—On examining the nitrogen effect a somewhat different state of affairs is found. The activity of nitrogen in presence of dung is but slightly less than in its absence, and the difference is of little practical account.

<i>Nitrogen Effect with and without Dung</i>					
Potatoes : Cwt. per acre increase per 1 cwt. Sulphate of Ammonia					
				With dung	No dung
<i>Rothamsted, 1923</i>	..	..	..	22	19
<i>Seale Hayne, 1927 :—</i>					
No Potash in basal dressing	..	..	..	21	12
1 cwt. Sul. Pot. in basal dressing	..	..	..	24	29
2 „ „ „ „	..	..	..	17	15
3 „ „ „ „	..	..	..	22	14
				—	—
Mean	..	..	..	21	17

The high degree of effectiveness of quick-acting nitrogen in spite of the presence of other sources of nitrogen was also observed in a striking way in a potato experiment in 1932. The land had clover ploughed in, a dressing of dung, and a further application of shoddy. In spite of all this the effect of further nitrogen in the form of sulphate of ammonia gave a significant increase in the potato crop.

The continuous mangold experiment on Barnfield, Rothamsted, presents a further comparison of the nitrogen effect with and without dung. Here there is also a basal dressing of phosphate and potash. The figures are in terms of 1 cwt. of sulphate of ammonia equivalent.

Mangolds : Cwt. per acre increase per 23 lb. N.				
Average of 50 seasons				
			Phosphate + Potash - Dung	Phosphate + Potash No dung
Nitrate of Soda	..	..	59	41
Sulphate of Ammonia	..	..	51	31
Rape Cake	..	..	66	35
Rape Cake and Sulphate of Ammonia			46	22
			—	—
Mean	..	..	55	32
			—	—

Here, in contrast to the results with potatoes mentioned above, the nitrogen is decidedly less active in the presence of dung. This result should be considered in relation to the special features of the experiment. The continuous dunging has raised the land to a very high condition, and the "no dung" controls (phosphate+potash without nitrogen) are extraordinarily depleted after 50 years of nitrogen starvation. The effect is a tendency to diminish the nitrogen effect in presence of dung and increase it in the absence of dung. The striking result is the high effectiveness of nitrogen even when used on land continuously and generously dunged.

For swedes grown in the ordinary rotation, two years' results at Rothamsted are available.

Swedes : Cwt. per acre increase per 1 cwt. Sulphate of Ammonia				No dung		With dung	
				Roots	Tops	Roots	Tops
1922	..	..	..	24	7	20	5
1923	..	..	..	19	3	26	3
Mean				22	5	23	4

This result agrees with that obtained with potatoes, the nitrogen being of the same order of activity with and without dung.

The Effect of Phosphates.—There is less evidence on the action of phosphate on potatoes in presence and absence of dung. The original potato experiment conducted in Hoosfield, Rothamsted, enables the following comparison to be drawn for a five-year period, 1876-80.

<i>Phosphate Effect with and without Dung</i>	
Potatoes : Increase per acre 1 cwt. Superphosphate	
With dung	No dung
3.7 cwt.	7.7 cwt.

The difference is small, but the indication is that the phosphate was less effective in presence of farmyard manure.

The response of clover hay to lime and superphosphate has also been of much the same order in presence and absence of dung.

Clover hay : Total increase per acre two cuts, 1921, 1922				No dung		With dung	
				10 cwt.		8 cwt.	
Lime (10 cwt.)	..	..	..	11		9	
Superphosphate (8 cwt.)	..	..	..	15		12	
Superphosphate + Lime	..	..	..	..		..

It appears, therefore, that in ordinary rotation cropping the effect of nitrogen is much the same whether used in the presence or absence of dung. Where a difference occurs the stronger effect is usually observed in the absence of dung. Potash seems to be rather less effective in presence of dung.

On the results of an examination of a large number of fertilizer trials carried out on ordinary farms in Germany, Dr. Nolte comes to the conclusion that nitrogenous fertilizers are most effective on holdings in which a normal amount of dung is available. Those on which dung is scarce or specially abundant give somewhat lower responses to mineral nitrogen.

Manures for Spring Corn.—Owing to the better prospects for wheat it is likely that more spring wheat will be sown this year than usual. At this season the first favourable opportunity will also be taken to make sowings of semi-winter oats. A few notes on the manuring of these crops may, therefore, be in place. In view of its shorter period of growth,

spring wheat may be treated rather more generously than autumn-sown wheat. If there is any doubt whether the land is in good enough heart to grow a full crop, a complete mixture consisting of 2 cwt. superphosphate, $\frac{1}{2}$ cwt. muriate of potash and 1 cwt. of sulphate of ammonia may be applied before drilling. On poor land the quantity of sulphate of ammonia may be raised to $1\frac{1}{2}$ or even 2 cwt., or alternatively a further top dressing of 1 cwt. of nitrate of soda, nitrate of lime, or nitrochalk may be given after the corn is well up. The order of importance of the manures is in general nitrogen, phosphates, potash. The first can only be dispensed with on soils in unusually high condition, when a dressing of phosphate may do something to balance the nitrogen already present. Potash comes in most strongly on light or chalky soils.

The treatment of spring oats may be carried out on the above lines also. The risk to be guarded against in manuring cereal crops is lodging. The farmer himself is the best judge of the maximum amount of nitrogenous manure that may be used on his own land. The choice of stiff-strawed varieties and the use of phosphate and potash in conjunction with the nitrogen is a safeguard; but these measures will not save a crop that has been overdone with nitrogen. Even in the drier parts of England 2 cwt. of sulphate of ammonia per acre or its equivalent may be regarded as the limit for cereal crops.

Fertilizers for Gardens.—Land that has been under hand cultivation for a period of years with occasional dressings of organic manure is usually capable of producing a creditable crop without fertilizer treatment. The depth of soil that has been brought into activity provides not only plant nutrients but also very favourable water relationship for the growing plant. This is particularly so on the heavier soils on which the plough land reveals a raw subsoil at a depth of about 9 in., whereas garden soil, originally of the same type, may show double that depth of uniform mould. Nevertheless, several factors tend to impoverish garden soils. Cropping is heavy and continuous. The crops grown are of the kind that will remove large quantities of plant nutrients from the soil. Moreover, crop residues that might well be restored to the land in the form of composts are too frequently burnt, with the complete loss of their organic matter and nitrogen. The thorough cultivation favours the rapid loss of organic matter, and free drainage coupled with high fertility leads to considerable wastage of nitrates. The result is that, on the balance,

fertilizers have a definite place in the cultivation of such soils, especially when the supply of stable manure is restricted.

Two examples frequently arise in practice. The soil has already been built up by successive applications of dung, and occasional dressings of manure are still supplied. The need for artificials is then reduced. A complete mixture containing a preponderance of phosphate may be tried in such instances, and given as a general dressing forked in before sowing or planting. A reasonable formula for trial would be 1 part sulphate of ammonia, 2 parts superphosphate, 1 part steamed bone flour and 1 part sulphate of potash. This mixture contains approximately 4 per cent. nitrogen, $5\frac{1}{2}$ per cent. soluble phosphoric acid, $5\frac{1}{2}$ per cent. insoluble phosphoric acid and 10 per cent. potash. The quantity should be about 5 lb. per rod or $2\frac{1}{2}$ oz. per square yard.

The second case requires more generous treatment. Dung has seldom been used and is rarely obtainable. Organic matter is, nevertheless, desirable, and crop residues should be returned to the soil in the form of Adco. The supply of plant nutrients will be rather less than under a system based on dung, and on light soils in particular potash and nitrogen will be insufficient. The mixture of artificials might then be modified to consist of 2 parts sulphate of ammonia, 2 parts superphosphate, 1 part steamed bone flour and 2 parts sulphate of potash. This gives an analysis of approximately 6 per cent. nitrogen, 4 per cent. soluble phosphoric acid, 4 per cent. insoluble phosphoric acid, 14 per cent. potash. A normal dressing would be at the rate of 8 lb. per rod or 4 oz. per square yard.

Compound fertilizers yielding approximately the same quantities of plant nutrients may, of course, be used instead of the above home-made mixtures; and owing to the heavy dressings used in horticultural practice, there is a case for the employment of certain of the high-analysis compound fertilizers now on the market.

PRICES OF ARTIFICIAL MANURES

Average price per ton during week
ended December 14.

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	8 12d	8 12d	8 12d	8 12d	11 1
" " Granulated (N. 16%) ..	8 12d	8 12d	8 12d	8 12d	10 9
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	6 2d	6 2d	6 2d	6 2d	5 11
Calcium cyanamide (N. 20·6%)	6 17e	6 17e	6 17e	6 17e	6 8
Kainit (Pot. 14%) ..	3 9	3 1	3 1	3 6g	4 9
Potash salts (Pot. 30%) ..	5 11	5 8	5 5	5 9g	3 8
" (Pot. 20%) ..	3 19	3 16	3 12	3 17g	3 10
Muriate of potash (Pot. 50%) ..	10 6	9 19	9 11	10 1g	4 0
Sulphate " (Pot. 48%) ..	12 1	11 16	11 11	12 0g	5 0
Basic slag (P.A. 15½%)||	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)||	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26·27½%)||	2 10a	2 8a	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%)	3 2	..	3 4	2 16k	3 6
" (S.P.A. 13½%)	2 17	2 9	3 0	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%)	6 10	6 5	7 5	6 7	..
Steamed bone-flour (N. 4%, P.A. 27½-29½%) ..	5 15	5 2	5 10	5 5	..

Abbreviations : N.—Nitrogen ; P.A.—Phosphoric Acid ; S.P.A.—Soluble Phosphoric Acid ;
Pot.—Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

‡ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails; southern rails, 2s. 6d. extra.

e Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra and for lots of 10 cwt. and under 1 ton 15s. extra.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails; southern rails, 1s. 3d. extra.

* * * * *

NOTES ON FEEDING

W. A. STEWART, M.A., B.Sc.(Agric.),
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Calf Rearing in Relation to Beef Production.—In the paper read before the Farmers' Club on December 5, Mr. W. J. Reid described the system of feeding and management that has been developed in certain parts of Scotland where the object is the production of highest quality meat. This system is not new, for it has been widely practised throughout the north-east for many years. In essence, the system involves the breeding of calves of a good beef type; these calves are usually born in winter or early spring; they suckle their dams, going out to grass with them in early May, and are then weaned about September. For some two weeks before weaning the calves are brought indoors overnight and kept away from the cows. During this period they are taught to eat some concentrated food and a small allowance of hay. This trough feeding is considered specially important in order to prevent them suffering any serious check or set back after weaning.

It is usual for the calves from the purely breeding farms to be sold at this stage by auction, at various centres. For the choicest suckled calves, suitable for feeding for exhibition at fat stock shows, high prices have been paid, reaching as much as £38 per head in 1932. Many farms, particularly in Aberdeenshire and Banffshire, carry on both breeding and feeding, but in certain other districts feeding only is practised, and the suckled calves bought at commercial prices go to these "feeding farms" to be fed for beef.

During their first winter the calves are generally housed in wholly or partly covered yards, and receive a liberal allowance of turnips, the quantity being gradually increased to 30 or 40 lb. per day, and either oat straw or hay, with or without a small allowance of concentrated food. Where specially early maturity is aimed at it is usual to give about 1 lb. of linseed cake and 2 lb. of a mixture commonly chosen from the following foods: crushed oats, crushed barley, flaked maize and bran. It has long been recognized that this method of feeding gives a reasonably good and steady rate of growth, but where the intention is to dispose of the cattle at, say, 18 months old, when they should weigh 9 cwt. live weight, it may be necessary to increase the concentrated food beyond 3 lb. per head as the winter advances. The young cattle go

out to grass in early May, and may be given concentrated food on the grass. Mr. Reid mentioned that he used linseed and cotton cakes for grass feeding, but did not claim that this is necessarily the most suitable kind of concentrated food for feeding on grass. Recent observations have shown that if cake is used it is better coupled with a food of starchy nature, such as maize cubes.

One must recognize that it is not possible to get all the young cattle off fat at 18 months old, or to finish them always on grass. Many have to be kept on till they are at least two years old, and we find that large numbers are still fattened during the winter months. Those are usually stall fed and given roots, straw or hay, and a more or less liberal allowance of concentrated foods. The concentrates already mentioned are recognized as suitable, but considerable elasticity can be practised, and advantage taken of current values in the selection of other foods. Rations conforming to the standard of about $1\frac{1}{2}$ lb. protein equivalent per day with the starch equivalent adjusted according to the desired rate of increase give satisfactory results.

Mr. Reid claimed that his system of beef production has been profitable, in any case, until recently. He quoted high average prices for weaned calves, but these averages are largely due to high individual prices paid for certain of the best, purchased for show purposes, and economically a system of calf rearing can hardly be based on the chance of selling a few of the best specimens at exceptionally high prices. The weakness of the system appears to rest chiefly on the high cost of rearing a single calf per cow, and Mr. Reid certainly did not seem to advocate attempting to rear more than a single one.

The returns obtainable from one calf reared per cow are not enough to meet costs under ordinary conditions of English farming, and if the system or some modification of it is to be practised successfully, in England, means would have to be found to increase the output per cow. Some 20 or 30 years ago it was not unusual for Aberdeen Angus cows in Scotland to rear two and three calves in the season, and if we go further back we find it on record that the cows in Hugh Watson's herd reared five calves in a lactation, two, two, and then one, at a time. Mr. Reid may not have meant to do so, but he seemed to indicate that Aberdeen Angus bulls could be mated for economic beef production to cows of almost any breed or cross, except pure-bred Aberdeen Angus. It must surely

be a matter for regret if the Aberdeen Angus breed has come to be regarded simply as one for bull breeding. Milking capacity is of fundamental importance in cows breeding and rearing calves for beef production, just as it is of the first importance in ewes and sows. For this reason a breed cannot remain of economic importance to the purely commercial breeder in so far as the cows of the breed are concerned unless these cows are capable of rearing in a season a sufficient number of calves which, valued at purely commercial rates, give a figure that covers the cost of feeding plus the other charges.

Ordinary "store calves" may be reared on 35 to 40 gallons of milk. It was reckoned by Mackenzie that a calf fit to be carried on for baby beef could be reared on 150 gallons of milk. On this basis a cow yielding 600 gallons in a lactation should rear four calves. A cow should give a 600-gallon yield under average conditions with little or no concentrated food. Grass and good hay should provide all the nutriment necessary. With careful management, a 750-gallon cow should rear five calves and a 900-gallon cow, six calves. Actually, these numbers of calves have been suitably reared for young beef production under commercial conditions on cows giving yields judged to be rather under than over the figures mentioned.

It has been shown that a limited allowance of milk can be supplemented with satisfactory results by means of various mixtures of concentrated foods fed dry to calves. One that has proved suitable is (parts by weight): 1 fish meal, 3 linseed cake, 3 crushed oats, 3 flaked maize, or, alternatively, 1 fish meal, 3 linseed cake, 2 crushed oats, 2 flaked maize, 2 bran. A question that might arise is, where are the extra calves to be found for rearing? The question may be answered without difficulty. There are many herds of Shorthorn dairy cows up and down the country where the calves are not reared, but sold at birth, and the cows in those herds, if crossed with good beef bulls, would supply the kind of calves required. Until breeding on those lines is actually organized, the rearer's best plan is to place a beef bull, by agreement, in a dairy herd, and take the calves at an arranged price.

Outdoor Wintering of Store Cattle.—For several years, a beef producer in Northamptonshire has bought Shorthorn-Galloway cross heifers annually in the autumn. At the time of purchase these heifers are from about 14 to 18 months old. They are wintered out-of-doors on grass, entirely without shelter, being given a limited allowance of fodder from December onwards,

but no roots or concentrated food. They stand the winter well, and quickly improve in condition when the grass becomes plentiful. It has proved possible to sell a number of the best, fat, off the grass, in late June or July; others go fat from then onwards, while those unsold are taken off the grass in late November and carried through to the early months of the

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	6 5
Maize	78	7.6	4 18
Decorticated ground-nut cake ..	73	41.3	7 17
„ cotton cake	68	34.7	8 5

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.47 shillings, and per unit protein equivalent, 1.78 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The “food values,” which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1932, issue of the Ministry's JOURNAL, p. 781.)

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 3
Oats	60	7.6	5 2
Barley	71	6.2	5 15
Potatoes	18	0.8	1 8
Swedes	7	0.7	0 12
Mangolds	7	0.4	0 11
Beans	66	19.7	6 12
Good meadow hay	37	4.6	3 3
Good oat straw	20	0.9	1 11
Good clover hay	38	7.0	3 8
Vetch and oat silage	13	1.6	1 2
Barley straw	23	0.7	1 15
Wheat straw	13	0.1	0 19
Bean straw	23	1.7	1 17

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 6d. net.

DESCRIPTION	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	5 10	0 9	5 1	72	1 5	0.76	9.6
Barley, British feeding ..	5 10	0 8	5 2	71	1 5	0.76	6.2
" Canadian No. 3 Western ..	6 8	0 8	6 0	71	1 8	0.89	6.2
" Danubian	6 5	0 8	5 17	71	1 8	0.89	6.2
" Persian	6 3*	0 8	5 15	71	1 7	0.85	6.2
" Russian	6 5	0 8	5 17	71	1 8	0.89	6.2
Oats, English white	6 7	0 8	5 19	60	2 0	1.07	7.6
" black and grey	6 0	0 8	5 12	60	1 10	0.98	7.6
" Scotch white	7 3	0 8	6 15	60	2 3	1.20	7.6
" Canadian No. 2 Western ..	7 3	0 8	6 15	60	2 3	1.20	7.6
" " No. 3	6 15	0 8	6 7	60	2 1	1.12	7.6
" " mixed feed	5 2	0 8	4 14	60	1 7	0.85	7.6
" Argentine	6 10	0 8	6 2	60	2 0	1.07	7.6
Maize, Argentine	4 18	0 7	4 11	78	1 2	0.62	7.6
Beans, English winter	5 15§	0 19	4 16	66	1 5	0.76	19.7
Peas, English blue	17 10§	0 16	16 14	69	4 10	2.59	18.1
" Indian	9 0†	0 16	8 4	69	2 5	1.29	18.1
" Japanese	32 15†	0 16	31 19	69	9 3	4.96	18.1
Dari	8 10†	0 9	8 1	74	2 2	1.16	7.2
Milling offals—							
Bran, British	5 17	0 18	4 19	43	2 4	1.25	9.9
" broad	6 15	0 18	5 17	43	2 9	1.47	10
Middlings, fine imported ..	6 7	0 13	5 14	69	1 8	0.89	12.1
" coarse British	5 17	0 13	5 4	56	1 10	0.98	10.7
Pollards, imported	5 10	0 18	4 12	62	1 6	0.80	11
Meal, barley	7 15	0 8	7 7	71	2 1	1.12	8.2
" grade II	7 0	0 8	6 12	71	1 10	0.98	6.2
" maize	5 15	0 7	5 8	78	1 5	0.76	7.6
" " South African	5 5	0 7	4 18	78	1 3	0.67	7.6
" germ	6 2	0 12	5 10	79	1 5	0.76	8.5
" locust bean	6 5	0 6	5 19	71	1 8	0.89	3.6
" bean	8 0	0 19	7 1	66	2 2	1.16	19.7
" fish	14 10	2 13	11 17	59	4 0	2.14	53
Maize, cooked flaked	6 10	0 8	6 2	84	1 5	0.76	9.2
" gluten feed	6 5	0 13	5 12	76	1 6	0.80	19.2
Linseed cake, English, 12% oil ..	8 7	1 2	7 5	74	2 0	1.07	24.6
" " " 9% "	8 2	1 2	7 0	74	1 11	1.03	24.6
" " " 8% "	7 17	1 2	6 15	74	1 10	0.98	24.6
Soya bean cake, 5½% oil	8 2*	1 11	6 11	69	1 11	1.03	36.9
Cottonseed cake—							
English, 4½% oil	5 10	1 2	4 8	42	2 1	1.12	17.3
Egyptian, 4½% oil	5 0	1 2	3 18	42	1 10	0.98	17.3
Decorticated cottonseed meal, 7% oil	8 2	1 11	6 11	68	1 11	1.03	34.6
Decorticated ground-nut cake, 6.7% oil	7 17	1 10	6 7	73	1 9	0.94	41.3
Palm-kernel cake, 4½-5½% oil ..	6 7§	0 13	5 14	73	1 7	0.85	16.9
" " meal, 4½% oil	6 17§	0 13	6 4	73	1 8	0.89	16.9
" " meal, 1-2% oil	5 17	0 13	5 4	71	1 6	0.80	16.5
Feeding treacle	5 0	0 8	4 12	51	1 10	0.98	2.7
Brewers' grains, dried ale	6 5	0 13	5 12	48	2 4	1.25	12.5
" " " porter	5 15	0 13	5 2	48	2 2	1.16	12.5
Malt culms	7 10†	1 1	6 9	43	3 0	1.61	16
Dried sugar beet pulp (a)	5 10	0 6	5 4	66	1 7	0.85	5.2

* At Bristol.

† At Liverpool.

§ At Hull.

(a) Carriage paid in 4 ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of November, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 22s. per ton as shown above, the food value per ton is £8 18s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 5d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.26d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 5s. 10d.; P₂O₅, 3s. 8d.; K₂O, 3s. 7d.

year in open yards, and fed on hay, sugar-beet pulp, and a moderate allowance of mixed concentrates. When brought indoors these heifers are in forward condition, but the better price usually current in the late winter and early spring months has induced the feeder to keep them on to secure the higher price per cwt. Comparatively little concentrated food is necessary; an allowance of 20 lb. of good hay daily supplies practically all the protein required, and sugar-beet pulp and other foods rich in carbohydrates are added in just sufficient quantity to maintain reasonable increase and "bloom." These cross heifers when sold may vary from two years and six months to three years old, but produce carcasses of "select" grade.

* * * * *

MISCELLANEOUS NOTES

A SECOND edition of the *Agricultural Atlas of England and Wales* has just been published by the Ordnance Survey Department.* The original publication

Agricultural Atlas showed agricultural distributions for the
of England and year 1918. The present edition, which
Wales has been prepared by Mr. Malcolm

Messer, M.A., on behalf of the Agricultural Economics Research Institute, Oxford, and published by direction of the Ministry, indicates distributions for the year 1928, thus affording an interesting comparison in the state of cropping and numbers of live stock during a decade. Three important distributions have been added, viz., Sugar Beet, Labour and Poultry; while the area covered by each map has now been extended to include the Channel Isles. The maps, which number 25, indicate the distribution of live stock, principal crops and labour of England and Wales by means of dots of uniform size, each having a definite value. A table accompanying each map gives the actual figures of distribution by counties. In order that each distribution may be studied in relation to the natural factors which affect it, geological, physical and rainfall maps are enclosed in a pocket. These maps are intended to be placed under the distribution maps, which for this purpose have been printed on transparent paper. The publication of the second edition of this Atlas will be welcomed by economists, statisticians and all who are concerned in agriculture.

* Obtainable from the principal booksellers throughout the country or direct from the Director-General, Ordnance Survey, Southampton. Price 10s.

THE agricultural index number for November at 101 was one point higher on the month and compares with a figure of 112 at the corresponding date last year.

The Agricultural Index Number The rise of one point in the general index was due principally to the higher prices for milk delivered under contract, and to

some extent by increases in the indices of fat sheep and pigs. These increases were partially offset by decreases in wheat, barley and eggs.

Monthly index number of prices of Agricultural Produce. (Corresponding months of 1911-13=100.)

Month	1927	1928	1929	1930	1931	1932
January	149	145	145	148	130	122
February	145	143	144	144	126	117
March	143	145	143	139	123	113
April	143	151	146	137	123	117
May	142	154	144	134	122	115
June	141	153	140	131	123	111
July	142	145	141	134	121	106
August..	142	144	152	135	121	105
September	143	144	152	142	120	104
October	140	139	142	129	113	100
November	137	141	144	129	112	101
December	138	140	143	126	117	—

Grain.—Quotations for wheat showed a further fall during November, the average of 5s. 5d. per cwt. being 2d. lower and the index fell by 3 points to 72 as compared with a figure of 90 a year ago, while oats were reduced by 4d. to 5s. 11d. per cwt. and were 5 points lower at 85. Barley at an average of 7s. 4d. was 9d. per cwt. cheaper and the index showed a decline of 9 points to 86, whereas there is usually little change between October and November.

Live Stock.—In the fat stock group, fat cattle were a little cheaper during the month under review, but otherwise prices were higher. Fat cattle fell about 3d. per live cwt. and the index was one point lower at only 1 per cent. above pre-war. Values for fat sheep advanced by $\frac{1}{2}$ d. per lb. and the index rose 4 points to 87, which compares with a figure of 113 at the corresponding period last year. Bacon pigs were 1d. and porkers 6d. per score dearer during November and the indices moved upwards by 3 and 4 points respectively. Although quotations for dairy cows were a little higher on the month, in accordance with the usual seasonal movement, the index fell one point to 117 owing to a relatively greater increase in price in the base years. Store sheep, although fully 1s. per head dearer, also showed a lower index for the same reason as dairy cows. Store cattle were about 3s. per head cheaper, but store pigs were 6d. per head dearer.

Dairy and Poultry Produce.—On average the contract price of milk again advanced during November and the index was 7 points higher at 152, whereas a year ago the index stood at 121. Butter and cheese were a little dearer during the month under review and the index for the former rose by 2 points to 97, while cheese was one point higher at 115. Quotations for eggs followed the normal seasonal movement and rose by approximately 3*d.* per dozen during November, but as the rise in the corresponding period of the base years was proportionately greater the index fell 9 points to 112. A fall of 6 points to 123 occurred between October and November, 1931. Ducks and geese were cheaper, but fowls were unaltered and the combined index for poultry at 121 was 5 points lower on the month.

Other Commodities.—A very slight rise of 6*d.* per ton occurred in potato prices during November, but there was a decline in pre-war years and this caused the index to advance 3 points to 123; a year ago the figure for November was 231. Hay was a little cheaper although the index at 67 showed no change, while wool was unaltered both as regards price and index.

Monthly index numbers of prices of individual commodities.
(Corresponding months of 1911-13=100.)

Commodity	1930	1931	1932			
	Nov.	Nov.	Aug.	Sept.	Oct.	Nov.
Wheat	89	90	80	76	75	72
Barley	111	106	90	103	95	86
Oats	83	98	106	96	90	85
Fat cattle	128	115	118	112	102	101
„ sheep	153	113	90	86	83	87
Bacon pigs	129	88	86	84	82	85
Pork „	150	102	87	87	88	92
Dairy cows	131	123	110	112	118	117
Store cattle	123	118	113	109	100	97
„ sheep	156	112	81	80	72	70
„ pigs	211	129	86	86	89	95
Eggs	133	123	115	124	121	112
Poultry	136	127	117	124	126	121
Milk	157	121	148	150	145	152
Butter	110	105	100	94	95	97
Cheese	116	106	125	116	114	115
Potatoes	146	231	106	114	120	123
Hay	93	78	68	69	67	67
Wool	83	79	61	62	62	62

ARRANGEMENTS have been made for a Conference on Modern Methods in Cereal Growing and Market Gardening to be held at the East Anglian Institute of Agriculture, Chelmsford, on Tuesday, January 31, 1933.

**Conference on
Cereal Growing
and Market
Gardening**

All the speakers are well-known farmers who have successfully introduced modern methods into their own systems of farming.

The Conference will be divided into two sessions beginning at 11 a.m. and finishing at 4 p.m.

Morning Session—11 a.m.

Mr. R. Dudley, Linkenholt Manor, Andover, Hants. :—

"Some Recent Applications of Modern Machinery to the Reduction of the Cost of Cereal Growing."

Mr. W. O. Watt, Heath Place, Orsett, Grays, Essex :

"Machinery in the Service of the Arable Farmer."

Afternoon Session—2 p.m.

Mr. Douglas Bomford, Pitchhill, Evesham, Worcs. :—

"Some Problems of Intensive Farming and Market Gardening with Mechanized Equipment."

Mr. A. E. Brown, Merston Manor, Newport, I.O.W. :—

"A Beginner's Efforts to Combine Market Gardening with Mixed Farming by the Aid of Machinery and Fertilizers."

Further information with regard to the Conference may be obtained from the Principal of the Institute, Chelmsford.

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**Special
Research Grants**

THE following awards of special research grants have been sanctioned for the academic year commenced on October 1, 1932 :—

<i>Institution</i>	<i>Investigation</i>	<i>Amount</i> S—Salary E=Expenses	<i>Investigator(s)</i>
Cambridge University, Department of Animal Pathology	Use of B.C.G. vaccine	E. £300	Prof. J. B. Buxton and Dr. A. S. Griffiths.
Oxford University, School of Rural Economy	Breeding of Oats for Resistance to Frit Fly	E. £235	Dr. N. Cunliffe
Reading University	Solids-not-fat in Milk	S. £208 E. £192	M. N. Nicholson and C. E. Lesser
Seale-Hayne Agricultural College	Broccoli Breeding	E. £160	F. R. Horne
Wye, South- Eastern Agricultural College	Struck and Gangrene Diseases of Sheep on Romney Marsh	E. £75	A. D. McEwen and R. S. Roberts
Oxford University: School of Rural Economy	Soil Survey Work	E. £50	G. R. Clarke

International Poultry Exhibition, Paris, 1933.—The Sixty-sixth International Exhibition organized by the Société Centrale d'Aviculture de France will take place in Paris from February 16 to 21 next. The exhibition, which is one of the most important of its kind to be held on the Continent, will include classes for live and dressed poultry, ducks, geese, turkeys, pigeons, rabbits for fur and flesh, as well as a large variety of appliances for breeding and rearing. Numerous prizes will be awarded, including a valuable work of art presented by the President of the Republic. A programme containing full details of the exhibition, conditions of entry, etc., may be obtained on application to the Secretary, Société Centrale d'Aviculture de France, 34 rue de Lille, Paris (VIIe).

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Foot-and-Mouth Disease.—Three further cases of foot-and-mouth disease occurring, since November 20, in the immediate vicinity of Caistor, near Lincoln, necessitated the continuance, for a longer period than usual, of the usual restrictions on the movement of animals imposed on the first outbreak of the disease in the neighbourhood. From the above date to December 28 inclusive, fresh outbreaks of the disease were confirmed at Lyndhurst, in the New Forest, on December 18; at Brasted, Sevenoaks, Kent, on December 22; at Tintern, near Chepstow, Monmouth, on December 23; and at Eastwood, near Southend, Essex, on December 24. Two further cases in the Monmouth area, above mentioned, were also confirmed on December 24. In each case, the usual restrictions were imposed on the movement of cattle, sheep, pigs, goats and deer within a 15 mile radius of the infected premises.

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Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W. 1, on Monday, December 12, 1932, the Rt. Hon. The Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders:—

Berkshire.—An Order continuing the operation of the minimum and overtime rates of wages from January 1, 1933 (i.e., the day following that on which the existing rates are due to expire), to December 30, 1933. The minimum rates in the case of male workers of 21 years of age and over are 28s. 6d. per week of 41 hours in the weeks in which Good Friday and Christmas Day fall and 50 hours in any other week, with payment for overtime at the rate of 8½d. per hour. In the case of female workers of 19 years of age and over the minimum rate is 5d. per hour for all time worked.

Cornwall and Isles of Scilly.—An Order fixing minimum and overtime rates of wages to come into operation on December 25, 1932 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until December 23, 1933. The minimum rates in the case of male workers of 21 years of age and over are 30s. (instead of 32s. as at present) per week of 33 hours in the week in which Boxing Day falls, 42 hours in the weeks in which Good Friday, Whit Monday and the day following New Year's Day fall, and 51 hours in any other week, with payment for overtime unchanged at 9d. per hour on weekdays and 10d. per hour on Sundays. The minimum rate in the case of female workers of 20 years of age and over is unchanged at 5d. per hour for all time worked.

Cumberland and Westmorland.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates to come into operation on January 1, 1933. The minimum rates are,

in the case of male workers of 21 years of age and over hired by the month or longer period, 38s. (as at present) per week of customary hours which is defined as consisting of 62 hours, and in the case of other whole-time male workers of similar ages, 30s. (instead of 31s. as at present) per week of 48 hours in winter and 31s. 6d. (instead of 32s. 6d. as at present) per week of 54 hours in summer, with payment for overtime unchanged at 8½d. per hour for all male workers. In the case of casual male workers of 18 years of age and over the minimum rate remains unchanged at 8d. per hour. For all female workers of 18 years of age and over the minimum rate is unchanged at 5½d. per hour for all time worked.

Derbyshire.—An Order continuing the operation of the existing minimum and overtime rates of wages from December 26, 1932 (i.e., the day following that on which the existing rates are due to expire) until December 25, 1933. The minimum rates in the case of male workers of 21 years of age and over are 7½d. per hour for a week of 54 hours with payment for overtime (i.e., employment on Sundays) at 10d. per hour and in the case of female workers of 18 years of age and over 5d. per hour with payment for overtime (i.e., employment on Sundays) at 8d. per hour.

Hampshire and Isle of Wight.—An Order fixing minimum and overtime rates of wages to come into operation on January 1, 1933 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until December 30, 1933. The minimum rates in the case of male workers of 21 years of age and over are 29s. 6d. (instead of 30s. 6d. as at present) per week of 43½ hours in the week in which Good Friday falls, 53½ hours in any other week in summer, 40½ hours in the week in which Christmas Day falls, and 48 hours in any other week in winter, with payment for overtime throughout the year unchanged at 8d. per hour, except in the case of carters, cowmen, shepherds and milkers for work in connexion with the immediate care of animals, in which case the overtime rate is 7½d. per hour. The minimum rate for female workers of 18 years of age and over remains unchanged at 5d. per hour for all time worked.

Leicester and Rutland.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates to come into operation on January 1, 1933. The minimum rates of wages for male workers of 21 years of age and over are 32s. (instead of 34s. as at present) in Leicester, and 30s. 6d. (instead of 32s. 6d. as at present) in Rutland, per week of 56½ hours in summer and 54 hours in winter, the overtime rates being unchanged in both counties at 9d. per hour on weekdays and 11d. per hour on Sundays. The minimum rate of wages for female workers of 18 years of age and over remains unchanged at 5d. per hour, with overtime at 8d. per hour for Sunday work.

Oxfordshire.—An Order continuing the operation of the minimum and overtime rates of wages from January 1, 1933 (i.e., the day following that on which the existing rates are due to expire), until April 1, 1933. The minimum rates in the case of male workers of 21 years of age and over are 28s. per week of 48 hours in winter and 50 hours in summer, with overtime at 8d. per hour on weekdays and 10d. per hour on Sundays. The minimum rate for female workers of 18 years of age and over is 6d. per hour, with overtime at 7½d. per hour on weekdays and 9d. per hour on Sundays.

Somerset.—An Order fixing minimum and overtime rates of wages to come into operation on December 25, 1932 (i.e., the day

following that on which the existing rates are due to expire) and to continue in force until December 23, 1933. The minimum rates in the case of male workers of 21 years of age and over are 30s. 6d. (instead of 32s. as at present) per week of 32½ hours in the week in which Boxing Day falls, 50 hours in any other week in winter, 42½ hours in the weeks in which Good Friday, Easter Monday and Whit Monday fall, and 52 hours in any other week in summer, with overtime throughout the period unchanged at 9d. per hour, except for overtime employment on the hay and corn harvests, when the rate is unchanged at 10d. per hour. The minimum rate for female workers of 21 years of age and over remains unchanged at 6d. per hour for all time worked.

Suffolk.—An Order fixing minimum and overtime rates of wages for male workers to come into operation on December 25, 1932 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until December 23, 1933. The minimum rates in the case of workers of 21 years of age and over are 28s. per week of 39½ hours in the week in which Boxing Day falls, 48 hours in any other week in winter, 41½ hours in the week in which Good Friday falls (instead of 50 hours as formerly), and 50 hours in any other week in summer, with in addition in the case of horsemen, cowmen and shepherds of 18 years of age and over, the sum of 6s. per week to cover employment up to 10 hours per week in connexion with the immediate care of animals. The overtime rate for all male workers of 21 years of age and over is 9d. per hour.

Surrey.—An Order fixing minimum and overtime rates of wages to come into operation on December 25, 1932 (i.e., the day following that on which the existing rates are due to expire) and to continue in force until December 23, 1933. The minimum rates in the case of skilled male workers (horsemen, stockmen and shepherds) of 21 years of age and over are 37s. (instead of 38s. 8d. as at present) per week of 51 hours in the weeks in which Boxing Day and Good Friday fall and 60 hours in any other week. In the case of other male workers (except casual workers) of 21 years of age and over the minimum rates are 30s. 9d. (instead of 32s. 3d. as at present) per week of 41 hours in the weeks in which Boxing Day and Good Friday fall and 50 hours in any other week. The minimum rate in the case of casual male workers of 21 years of age and over is 7½d. per hour (instead of 7¼d. per hour as at present). The overtime rates for all classes of adult male workers are 9d. per hour on weekdays and 11d. per hour on Sundays (instead of 10d. and 11½d. per hour respectively as at present). In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5½d. per hour, with overtime at 7d. per hour on weekdays and 8d. per hour on Sundays.

Warwickshire.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates to come into operation on January 2, 1933. The minimum rates of wages are in the case of male workers of 21 years of age and over unchanged at 30s. per week of 52 hours in summer and 48 hours in winter with overtime at 8d. per hour (instead of 9d. per hour as at present). In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5d. per hour with overtime at 6d. per hour on weekdays and 7½d. per hour on Sundays.

Wiltshire.—An Order continuing (with a modification in respect of the week in which Christmas Day falls) the minimum and over-

time rates of wages from January 1, 1933 (i.e., the day following that on which the existing rates are due to expire), until December 30, 1933. The minimum rates in the case of male workers of 21 years of age and over are 30s. per week of 41 hours in the weeks in which Good Friday and Christmas Day fall and 50 hours in any other week, with overtime at 8d. per hour (except for employment on the hay and corn harvests when it is 9d. per hour). The minimum rate in the case of female workers of 18 years of age and over is 5d. per hour for all time worked.

Yorkshire (North Riding).—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates to come into operation on January 1, 1933. The minimum rates are, in the case of male workers of 21 years of age and over (other than casual workers), 31s. 6d. (instead of 32s. 6d. as at present) per week of 50 hours in winter and 52½ hours in summer, with payment for employment in connexion with the care of and attendance upon animals, where the total hours exceed the number mentioned above, at 3d. per hour for those workers who are boarded and lodged by their employer, and 6d. per hour for those who are not so boarded and lodged. The differential rates for overtime employment are 9d. per hour on weekdays and 11d. per hour on Sundays (instead of 10d. and 1s. per hour respectively as at present). In the case of male casual workers of 18 years of age and over the minimum rate remains unchanged at 6d. per hour for all time worked. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 6d. per hour for a week of 44 hours with overtime at 9d. per hour.

Anglesey and Caernarvon.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates to come into operation on January 2, 1933. The minimum rate in the case of male workers of 21 years of age and over, wholly or mainly employed as horsemen, cowmen, shepherds or lhwyrnyn (bailiffs) is 33s. (instead of 35s. as at present) per week of 60 hours. In the case of other male workers of similar age the minimum rate is 29s. 6d. (instead of 31s. as at present) per week of 50 hours. The overtime rate for all classes of male workers of 21 years of age and over is unchanged at 9d. per hour. The minimum rate for female workers of 18 years of age and over remains unchanged at 6d. per hour for all time worked.

Denbigh and Flint.—An Order fixing minimum and overtime rates of wages to come into operation on February 16, 1933 (i.e., the day following that on which the existing rates are due to expire), and to continue in force until February 15, 1934. The minimum rate in the case of male workers of 21 years of age and over, employed wholly or mainly as teamsmen, cattlemen, cowmen, shepherds or bailiffs is 34s. (instead of 35s. as at present) per week of 60 hours. In the case of other male workers of 21 years of age and over the minimum rate is 30s. 6d. per week of 50 hours in winter and 54 hours in summer (instead of 50 hours per week throughout the year as at present). The overtime rate for all classes of male workers of 21 years of age and over remains unchanged at 9d. per hour. In the case of female workers of 18 years of age and over the minimum rate remains unchanged at 5d. per hour for a week of 48 hours with overtime at 6½d. per hour.

A further meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W.1, on Tuesday, December 20, 1932, the Rt. Hon. the Viscount Ullswater, G.C.B., presiding.

Norfolk.—The Board considered a notification from the Norfolk Agricultural Wages Committee of its decision fixing the minimum and overtime rates of wages and proceeded to make an Order con-

tinuing (with a modification in respect of the week in which Good Friday falls) the operation of the minimum and overtime rates of wages for workers employed in agriculture from January 1, 1933 (i.e., the day following that on which the existing rates are due to expire) until July 1, 1933. The minimum rates in the case of male workers of 21 years of age and over are 30s. per week of 48 hours in any week in winter, 45 hours (instead of 42 hours as formerly) in the week in which Good Friday falls, and 53 hours in any other week in summer with, in addition, in the case of workers employed as teamsmen, cowmen, shepherds, or yardmen 5s. 6d. per week, and in the case of sheep-tenders and bullock-tenders 4s. 6d. per week in lieu of overtime in respect of work in connexion with animals (other than such work on Good Friday, in respect of which an additional sum of 5s. is payable). The overtime rates in the case of all male workers of 21 years of age and over are 9d. per hour on weekdays and 11d. per hour on Sundays. The minimum rate in the case of female workers of 18 years of age and over is 5d. per hour with overtime of 6½d. per hour on weekdays and 7½d. per hour on Sundays.

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Enforcement of Minimum Rates of Wages.—During the month ending December 14 legal proceedings were taken against seven employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee area		Court	Fines imposed			Costs allowed			Arrears of wages ordered			No. of workers involved	
			£	s.	d.	£	s.	d.	£	s.	d.		
Kent	..	Dover	..	8	0	0	0	10	0	38	8	9	4
Lancashire		Bury	..	2	0	0	3	13	0	52	0	0	2
Lancashire		Church	..	2	10	0	0	10	0	11	5	6	2
Lincoln, Kesteven & Lindsey		Lincoln	..	1	1	0	3	6	6	14	7	0	1
Lincoln, Kesteven & Lindsey		Spilsby	..	1	0	0	0	6	0	3	16	9	1
Nottingham		Mansfield	..	4	0	0	--	--	--	11	0	11	2
Nottingham		Worksop	..	1	10	0	--	--	--	7	0	4	3
			£20	1	0	£8	5	6	£137	19	3	15	

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS :

ENGLAND

East Sussex : Mr. F. A. Pearson, B.Sc., has been appointed Assistant Lecturer at the Plumpton Farm Institute.

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NOTICES OF BOOKS

Rothamsted Memoirs in Agricultural Science. Vol. XV (1922-31). Pp. 936. Vol. XVI (1922-32). Pp. 38. (Harpندن: Rothamsted Research Station. Price 36s. each, foreign postage extra.)

These volumes, containing 56 and 63 memoirs respectively, are obtainable, bound in half calf, on application to the Secretary at the

above address. Orders should be accompanied by remittances, and as the editions are strictly limited early application is advisable.

Commercial Bulb Growing. Pp. 77. (London: "The Nurseryman and Seedsman," 62 Doughty Street, W.C.1. Price 7s. 6d.)

The title of this brochure is somewhat misleading, for it devotes far more attention to bulbs suitable for use in producing blooms for the market than to the actual culture of the bulbs. Growers will find here in convenient form a considerable amount of useful information, including practical time-tables for forcing narcissi, daffodils, hyacinths and iris. It is difficult, however, to justify the price at which the book is published.

Modern Productive Farming. By K. C. Davis, Ph.D. Sixth Edition, revised and enlarged. Pp. xxxix+403 and 252 figs. (London: J. B. Lippincott Co. Price 6s.)

America has probably outpaced our own country in recognizing the cultural value of teaching practical subjects, and the avowed aim of this volume is that it should become a text-book of agriculture for rural schools of all kinds, chiefly below high-school rank. In form and content it has been put together on the familiar, staccato, paragraphed, transatlantic model; it furnishes the salient facts with scarcely a vestige of a story or philosophy. On reading the introduction we thought we had happened upon something lacking in the English armoury, an "omnibus" treatment of the subject of agriculture for scholars of senior school age, but the hope disappeared. It might be of service to a master of a rural school to dip into for the sake of the exercises and projects.

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SELECTED CONTENTS OF PERIODICALS

Horticulture

Studies on Maturity of Fruit: I. Introductory. II. Preliminary Observations on the Rate of Softening of Apples. *J. C. Hinton.* (Long Ashton Agric. and Hort. Res. Stat. Ann. Report, 1931, pp. 40-53.) [58.11; 63.41.]

Studies on Maturity of Fruit: III. Starch Content in Relation to Maturity of Apples Grown under Various Orchard Conditions. *J. C. Hinton.* (Long Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 54-67, pl. I-III.) [58.11; 63.41.]

Further Observations on the Influence of Position in the Cluster on the Quality of Apples. *J. C. Hinton, J. O. Jones and F. C. Lewis.* (Long Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 68-76.) [63.41.]

Studies in Apple Storage: I. The Influence of Fungicides on Flavour and Sugar Content. *J. F. Hockey and R. W. Ward.* (Sci. Agric., XII, 12 (August, 1932), pp. 709-715.) [63.295; 63.41-198; 63.41.]

Studies of Growth and Fruit Bud Formation. No. 1: A Year's Observations on Victorian Apples. *O. Barnard and F. M. Read.* (Jour. Dept. Agric., Victoria, XXX, 7 (July, 1932), pp. 349-361.) [58.11; 63.41.]

Chemical Studies in the Physiology of Apples: XII. Ripening Processes in the Apple and the Relation of Time of Gathering to the Chemical Changes in Cold Storage. *H. K. Archbold.* (Ann. Bot. XLVI, CLXXXIII (July, 1932), pp. 407-459.) [58.11; 63.41; 63.41-198.]

Chemical Studies in the Physiology of Apples: XIII. The Starch and Hemicellulose Content of Developing Apples. *Elsie M.*

- Widdowson*. (Ann. Bot. XLVI, CLXXXIII (July, 1932), pp. 597-631.) [58.11; 63.41.]
- The Development and Cytology of the Leaves of Healthy and "Silvered" *Victoria* Plum-trees. *Ursula Tetley*. (Ann. Bot. XLVI, CLXXXIII. (July, 1932), pp. 633-652, pl. XIX and XX.) [575; 58.11.]
- Some Aspects of Morello Cherry Culture. *N. H. Grubb*, *A. C. Painter* and *H. Wormald*. (East Malling Res. Stat. Ann. Rept., 1931, pp. 57-60.) [63.41.]
- Pollination in Relation to Cherry Orchards. *C. H. Hooper*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 244-246.) [63.41 (08); 63.41.]
- The Identification of Red Currant Varieties. *C. R. Thompson*. (Long Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 28-39.) [63.41.]
- The Domestic Preservation of Fruit and Vegetables: Progress Report, 1926-1931. *Margaret L. Adams*. (Long Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 177-184.) [664.84; 664.85.]

Plant Diseases and Pests

- Progress Report on Vegetable Diseases: III. *L. Ogilvie* and *B. O. Mulligan*. (Long Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 119-132, pl. I, II.) [63.23; 63.24-51.]
- Chlorosis of Deciduous Fruit Trees due to a Copper Deficiency. *F. G. Anderssen*. (Jour. Pom. and Hort. Sci., x, 2 (June, 1932), pp. 130-146, pl. I-VIII.) [63.21.]
- Observations upon the Incidence of "Reversion" and the Control of "Big Bud" in Black Currants. *T. Swarbrick* and *C. R. Thompson*. (Long Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 101-111.) [63.23; 63.27.]
- Cytological Studies of Potato Plants affected with certain Virus Diseases. *Phyllis Clinch*. (Sci. Proc. Roy. Dublin Soc. 20 (N.S.), 15 (May, 1932), pp. 143-172, pl. 4-8.) [63.23; 63.512.]
- A Critical Review of some Recent Work on the Occurrence of Virus Complexes in the Potato. *P. A. Murphy*. (Sci. Proc. Roy. Dublin Soc. 20 (N.S.), 18 (May, 1932), pp. 193-210.) [63.23; 63.512.]
- The Compound Nature of Crinkle, and its Production by Means of a Mixture of Viruses. *P. A. Murphy* and *R. M'Kay*. (Sci. Proc. Roy. Dublin Soc. 20 (N.S.), 20 (May, 1932), pp. 227-247, pl. 10-12.) [63.23.]
- Studies on Plant Virus Diseases: XI. Further Experiments with a Ringspot Virus: Its Identification with Spotted Wilt of the Tomato. *K. M. Smith*. (Ann. App. Biol. XIX, 3 (August, 1932), pp. 305-330, pl. XIV-XVIII.) [63.23.]
- The Influence of Environmental Conditions on the Development of the Angular Leaf Spot Disease of Cotton: IV. The Influence of Atmospheric Humidity on Infection. *R. H. Stoughton*. (Ann. App. Biol., XIX, 3 (August, 1932), pp. 370-377.) [63.23.]
- The Control of Club Root of Brassicas: 1931 and 1932 Trials in Cheshire. *W. E. Shewell-Cooper*. (Gardeners' Chron., July 30, 1932, p. 83.) [63.24.]
- Notes on the Rusts of Basket Willows and their Control. *L. Ogilvie*. (Long Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 133-138, pl. I.) [63.24-34.]
- Observations on Hop Diseases in Herefordshire and Worcestershire with Suggestions for their Control. *L. Ogilvie*. (Long

- Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 139-142.) [63.24-34.]
- The Small Hop Disease. *E. S. Salmon* and *W. M. Ware*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 22-27.) [63.21.]
- The Control of Apple Scab on Worcester Pearmain and Allington Pippin: A Three Years' Experiment. *W. Goodwin*, *E. S. Salmon* and *W. M. Ware*. (Jour. S.E. Agric. Coll., Wye, 30 (July, 1932), pp. 28-50.) [63.24.]
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Cider

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The Clarification of Cider by the Centrifuge Method: II. *O. Grove*. (Long Ashton Agric. and Hort. Res. Stat. Ann. Rept., 1931, pp. 168-170.) [663.3.]

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NOTES FOR THE MONTH

THE following note has been communicated by Mr. F. J. Prewett, Institute for Research in Agricultural Economics :—

The article entitled "Milk Production on Arable Land," published in this **JOURNAL** in September last, has produced an inquiry as to the reason for the increasing surplus of cash income over expenditure as the percentage of arable land increased.

In the first place, it should be noted that the cash expenditure per acre remained fairly constant for all proportions of arable and grass, save for the group in which only 0-30 per cent. of the holding comes under the plough. In this group, expenditure per acre was high. Cash income per acre for the 0-30 per cent. arable group and for the 70-100 per cent. arable group, that is, for the mainly grass and for the mainly arable farms, were equal, but the high expenditure per acre in the former group reduced the amount of surplus income. For intervening groups income was lower and constant.

The favourable returns of the 70-100 per cent. arable group depended on feeding home-grown produce to the dairy herd, and dispensing with the heavy expenditure on purchased foods which was associated with the mixed arable and grass farms and the farms almost all grass. The yield of milk per cow was conspicuously higher in the 70-100 per cent. arable group than in any of the others, and fell off consistently as the proportion of grass increased. All farms, irrespective of the proportion of arable to grass, depended on milk production for 50 per cent. of their total income, and so the 70-100 per cent. arable group, with low costs and a high milk yield, and correspondingly high cash returns per cow, showed the most favourable cash surplus. Seeds hay, providing a greater bulk per acre than meadow hay, at a small increase in harvesting costs, was fed almost exclusively in this group, as against an almost exclusive feeding of meadow hay in the 0-30 per cent. arable group. By these means the cash expenses per acre in the 70-100 per cent. arable group were kept down to the

level of the mixed arable and grass groups and below that of the mainly grass group, while the milk yield per cow (and 90 per cent. of the milk was sold liquid) was definitely higher than that of any other group.

Again, with expenditure remaining at the same level as for the mixed arable and grass groups, the 70-100 per cent. arable group showed cash returns for cattle, pigs, sheep and wool, and poultry about equal to those for the other groups, while the sales of potatoes and of corn and straw were much higher.

The farms of the 70-100 per cent. arable group averaged 69 acres in area, as against 76 acres for the remaining groups. Family and employed labour amounted to £3 10s. 0d. per acre on the former, as against £3 0s. 0d. per acre on the latter ; but the wages bill, as a proportion of the total farm expenditure, was the same in the 70-100 per cent. arable group as in the others, the higher wage costs per acre being offset by the lower expenditure on purchased feeding stuffs. The higher milk yield per cow and the considerable sales of potatoes, corn and straw reflect a more intensive utilization of land in the 70-100 per cent. arable group as compared with the mixed arable and grass groups, and thus appear as a greater surplus of cash income over cash expenditure per acre.

* * * * *

THE following note is contributed by Messrs. F. H. Garner, M.A., and H. G. Sanders, M.A., Ph.D., School of Agriculture, Cambridge :—

**Sulphuric-Acid
Treatment of
Sugar-Beet Seed.**

A brief summary of the results of work carried out at Cambridge on the sulphuric-acid treatment of sugar-beet seed appeared in this JOURNAL in April, 1931 ; the experiments have been continued and, in view of the economic possibilities of the treatment, it is felt that a further note is desirable.

The effects were not very distinct in 1931 ; in that year the firm supplying the seed had treated it on a large scale for the first time, and apparently the technique was at fault for the coat was not adequately removed. A very full plant (from 30,000 to 40,000 per acre) was obtained on all plots, irrespective of treatment, and consequently although sulphuric-acid treatment increased the plant population by 8 per cent. it increased the weight of roots by 1 per cent. only. In 1931 milled seed gave returns very similar to those given by seed treated with sulphuric acid.

Both of these treatments reduce the size of the "seed," and in field scale work it has been found impossible to adjust a drill to sow equal numbers per acre of treated and of untreated seed. In 1932, therefore, work was restricted to smaller plots, with which seed might be dibbled by hand, so avoiding the uncertainty introduced by varying numbers of seeds per acre. Untreated, milled and sulphuric-acid-treated seed were all included, there being 28 plots of each.

Sulphuric-acid-treated seed germinated more quickly and more thoroughly (there were only one-half the number of misses) than untreated seed, and the plots sown with it showed to great advantage throughout the growing period. Milled seed, on the other hand, was disappointing, and gave 20 per cent. more misses than did the untreated seed.

The relative results obtained at harvest were as follows:—

	<i>Untreated</i>	<i>Milled</i>	<i>Sulphuric-Acid Treated</i>
Number of Beet ..	100	94	117
Weight of Roots ..	100	99	108
Weight of Tops ..	100	99	110

Separate samples taken from each plot showed that dirt tare and sugar percentages were the same for each group, so that the relative yields of sugar were as shown for the weight of roots. The 8 per cent. increase given by sulphuric-acid treatment represented an added yield of 1.34 tons of uncleaned beet, or 0.16 tons of sugar, per acre. At the prices current during 1932 this was worth 41s. 3d.; any additional expense would be more than covered by the value of the extra yield of tops, so that £2 per acre is a conservative estimate of the net profit derived from sulphuric-acid treatment.

It is hoped that sugar-beet seed treated with sulphuric acid will be made available to farmers in the near future, possibly in time for the 1933 sowings. It may be that similar treatment will prove beneficial with the seed of some other crops; during the last two years it has been tried at Cambridge with mangolds, but as yet no opinion as to its efficacy can be expressed.

* * * * *

THE Ministry will continue during the coming season to test, at the Potato Testing Station of the National Institute of Agricultural Botany at Ormskirk, Potatoes and Potato Seedlings as to their immunity from or susceptibility to Wart Disease on the conditions stated below.

**Wart Disease
Immunity Trials,
1933**

The entry form (No. 345 H.D.), obtainable from the Ministry, should be filled up and returned to the

Potato Testing Station, Ormskirk, Lancs., *with the requisite fees*. Samples must be sent to that Station *as early as possible, but in any case not later than March 1*.

Potatoes are accepted from *English, Scottish and Irish growers* for trial under the following conditions:—

(a) Quantity of each stock of Potato to be sent for the first time—50 seed-size tubers.

Quantity of each stock of Potato to be sent for the second and for subsequent years—35 seed size tubers.

(b) Fees on the following scale are payable in respect of each stock of Potato when first entered for immunity trials:—

Less than 5 samples from one grower 10s. per sample.

5 samples or more from one grower 8s. per sample up to 20, and 6s. for each sample in excess of 20.

These fees are not returnable in any circumstances.

(c) The Ministry, while taking reasonable precautions to secure satisfactory growth, can accept no responsibility for the failure of any variety.

(d) The Ministry will take all reasonable precautions to secure that all the produce of the trial plots is fed to stock after being thoroughly mixed together, except such portions as may be needed for exhibition or scientific purposes authorized by the Ministry. The Ministry, however, reserves the right to send tubers from the produce grown at Ormskirk for testing at the official stations of the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland.

(e) All stocks entered for the trials will be tested both in the laboratory and in the field. When the Ministry is satisfied as a result of the trials that a variety is immune from Wart Disease, it will formally "approve" the variety and will issue an official certificate of immunity. Such certificates will not be issued until the variety has been named and until an assurance has been received from the sender that it has been, or is about to be, introduced into commerce. *When a variety tested under a number or letter has been subsequently named and "approved," a sample of 100 tubers of the variety as named must be sent to Ormskirk for comparison with the tested stock.* No certificate will be issued for any new variety until it has passed at least two consecutive years' tests without contracting the disease and has been declared by the Synonym Committee of the National Institute of Agricultural Botany to be distinct from existing varieties.

Potatoes are accepted from *foreign growers* on the conditions

(a) to (d) set out above, but no foreign variety will be formally "approved" and no certificate will be issued until the variety is definitely introduced into commerce in Great Britain.

Trials of Seedlings.—The Ministry desires to encourage the breeding of new varieties of potatoes, and in order to provide information for breeders of seedlings it is prepared to accept not fewer than two tubers, and not more than ten tubers, of any seedlings for testing in the laboratory and growing for one season on the trial plots, and to furnish a report on the results obtained, without payment of a fee. These tests, however, will

not be considered as forming part of the Immunity Trials proper, and will not be reckoned in the minimum period of two years referred to under (e). The results of these tests will not be included in any report issued by the Ministry.

GENERAL INSTRUCTIONS : Carriage.—Small consignments should be sent by passenger train, carriage paid, or by parcel post; larger consignments should be forwarded by goods train, carriage paid.

Labels.—All consignments should be distinctly labelled. A label bearing the name and address of the sender and name of variety or seedling number should be firmly tied to the bag; in addition a similar label should be placed inside the bag.

Address.—All consignments should be addressed to :—

THE SUPERINTENDENT,

POTATO TESTING STATION,

NATIONAL INSTITUTE OF AGRICULTURAL BOTANY,
ORMSKIRK, LANCS.

Station : Ormskirk, L.M. & S. Railway.

Date of Forwarding.—Consignments should be sent so as to reach the Testing Station as early as possible, and in any case not later than March 1.

* * * * *

THE Twenty-second Report of the Development Commissioners deals with the year ended March 31, 1932.* The introduction to the more detailed parts

The Development Commissioners' Twenty-second Report of this report is of particular interest because it describes the growth of agricultural research since the early years of the century. At that time, apart from one

institution, organized agricultural research in this country was almost non-existent, and the agricultural teaching service was hampered by lack of native specialized scientific workers to whom questions of more than general character might be referred. The remarkable development that has taken place in a little over twenty years is mainly due to the provision of Government funds for buildings, equipment, etc.

The kind and types of research at present being carried out, although fairly well known amongst the agricultural community, are here described in a concise and comprehensible manner. Reference is made to the stringent examination of expenditure necessitated by the financial situation; and the methods adopted to avoid the abandonment of work on the eve of fruition.

* Obtainable through any bookseller, or direct from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, price 2s. or, post free, 2s. 2d.

The detailed description of the work of the various agricultural research institutes is supplemented by an equally detailed report upon the work that has been undertaken in fisheries research.

* * * * *

The following statement has been issued by the Board of Trade and the Ministry of Agriculture and Fisheries in regard to supplies of imported meat :—

**Imported Meat
Supplies**

In accordance with the arrangements made on November 7 last, the marketings of chilled beef from South America were reduced by 10 per cent. from November 15 to the end of the year. Arrivals for the first six weeks of the current quarter will be about 10 per cent. below the rate permitted by the Ottawa Agreements, and it is the present intention that the same reduction shall apply till the end of March.

The imports of frozen beef and frozen mutton and lamb from all foreign countries in the current quarter are limited under the Ottawa agreements to 90 per cent. of the quantity imported a year ago.

In accordance with the arrangements made on November 7, the shipments of mutton and lamb from Australia in November and December were reduced by 10 per cent. in comparison with the shipments made in the same months of 1931. From various causes, the reduction in shipments from New Zealand was, in fact, considerably greater, viz., 44½ per cent. in the case of mutton and 37 per cent. in the case of lamb.

As regards shipments in the current year, in conformity with the arrangements made at Ottawa, the total quantity of mutton and lamb to be exported to the United Kingdom in 1933 from Australia and New Zealand will not exceed the quantities shipped during the year ending June 30, 1932. Australia is also arranging to spread her shipments as far as practicable without creating unduly large stocks in cold store which would have a depressing effect on the market. New Zealand also will, as hitherto, regulate her shipments in accordance with the anticipated requirements of the market.

Particulars communicated to the Board of Trade as to stocks of beef, mutton and lamb and of bacon and hams held by cold storage companies in Great Britain on January 1, 1933, show that the position was not abnormal.

As regards bacon and hams, the agreement of the principal exporting countries has been obtained to the continuance until February 22 of the arrangements in force for the period

from November 23 to January 22 for the reduction of imports of bacon and hams by some 15 per cent. as compared with a year ago. In the meantime, the steps to be taken after February 22 will be discussed with the representatives of the countries concerned.

The effect of these arrangements is kept under review by the Advisory Committee recently appointed under the chairmanship of the Marquess of Linlithgow. A meeting of the meat section of that Committee was held on January 20, and a meeting of the bacon section will be held shortly.

* * * * *

THE following note has been communicated by the National Institute of Agricultural Botany, Huntingdon Road, Cambridge :—

Cereals for Spring Sowing Choice of seed is one of the principal factors in growing a good crop. Though it costs just as much to grow a bad variety as a good one, and sometimes more, there may be a difference of 20 per cent. in the value of the crops. Farmers have to take the weather as it comes, but in the matter of seed their choice is free, and to help them they have the results of the trials carried out in the midlands, east and south of England by the Institute, in collaboration with Local Education Authorities. If they use this information, and see that the seed is clean, is treated with a fungicide and germinates well, they will have gone a long way towards ensuring success.

Growers who decide to sow spring wheat, in spite of the risk of getting relatively smaller crops, are likely to do best by using Little Joss up to the end of February, A.1 or Red Marvel (Japhet) in March, and April Bearded for the latest sowings. The earlier the sowing on a suitable seed-bed the better is the chance of success.

Oat trials recently carried out over the whole country by County Agricultural Organizers have confirmed the merits of Golden Rain II for use where the crop is to be used on the farm. Victory and Star also yield well and find a readier market owing to their white colour. Eagle and Progress are promising among the newer varieties. Marvellous gives heavy crops of coarse grain on rich land, but it should not be sown after the middle of February.

Plumage-Archer, 1924, and Spratt-Archer are deservedly the favourite malting barleys south of the Humber. Both will do well in all normal circumstances, but anyone who

does not yet know Spratt-Archer should certainly give it a thorough trial. The new variety, Golden Archer, coming from the well-known breeder Dr. Beaven, is sure to receive attention. If very early ripening is important, Victory should be considered.

* * * * *

THE following note has also been communicated by the National Institute of Agricultural Botany.

Potato growers can get useful help from a leaflet which the Institute issues, free of charge, direct to growers or through County Agricultural Organizers.

The best of the first-earlies in order of maturity are Arran Crest (immune from wart disease), Epicure, Duke of York, Sharpe's Express and Eclipse. Arran Crest is the heaviest yielder and Epicure comes next. There is little difference between the other three. Arran Pilot is a new immune first-early of great promise. Di Vernon (immune) and May Queen deserve consideration for garden use because of good quality.

Good second-earlies are scarce and the best is still the old susceptible variety British Queen. Fortunately most of the early maincrops can, particularly if boxed, be lifted soon enough to serve the same purpose. The best of this group in order of maturity are Great Scot (immune), King Edward, Majestic (immune) and Arran Banner (immune). King Edward is a very popular variety for its shape and cooking quality, but it yields less than the other three. Majestic out-yields Great Scot, and Arran Banner has been proved to yield as heavily as any variety in any group.

Late maincrops also play an important part in the country's supplies. Of those recommended by the Institute Golden Wonder (immune) ripens first, then Arran Chief, and last of all Kerr's Pink (immune). Kerr's Pink is renowned for its big yields, and Golden Wonder, a relatively light cropper, for its quality; it is very necessary to be sure that only healthy seed of Golden Wonder is used, or the crop will be disappointing.

Health of seed must be considered, whatever variety is grown. Virus disease is one of the greatest enemies of the crop and the only way yet known of keeping it at bay is to get fresh seed potatoes at frequent intervals from reliable sources. The cutting of tubers for seed is a useful economy that does not reduce the yield, but whether tubers are cut or not, sets weighing from 1½ to 2 oz. produce the heaviest crop.

* * * * *

APPLE SCAB SPRAYING EXPERIMENTS IN THE WISBECH AREA

THE TIMES FOR APPLICATION

W. F. CHEAL, D.I.C.,

Horticultural Superintendent, Isle of Ely County Council.

MESSRS. Petherbridge, Dillon Weston and Kent, in a valuable account¹* of experiments on the control of Apple Scab in the Wisbech area, state that from two applications of fungicide to Worcester Pearmain in 1927 at (a) "pink-bud" stage (May 2) and (b) after the fruit had set (May 23) the following average results were obtained:—

Spray Treatment	Percentage of Fruit		
	Clean	Slight Scab	Bad Scab
Bordeaux mixture, 10 : 3 : 40, with lead arsenate	48	42	9
Lime-sulphur, 1 in 30 and 1 in 60, and lead arsenate	6	44	50
Unsprayed	0.2	7	93

From three applications of fungicide to the same trees, in 1928, at (a) "pink-bud" stage (May 1), (b) after blossoming (May 21) and (c) on June 15, the following average results were recorded:—

Spray Treatment	Percentage of Fruit		
	Clean	Slight Scab	Bad Scab
Bordeaux mixture, 10 : 3 : 40, with lead arsenate	72	21	7
Lime-sulphur, 1 in 30 and 1 in 60, with lead arsenate	30	50	20
Unsprayed	0.24	10	90

Petherbridge² gives the 1929 results from spraying trials on the same trees as under:—

Spray Treatment	Percentage of Fruit		
	Clean	Slight Scab	Bad Scab
Excess Bordeaux mixture	98*	1.6	0.4
Lime-sulphur, 1 in 30 and 1 in 60 ..	91	7	2
Unsprayed	51	42	7

* 14 per cent. russeted.

The pre-blossom spray was applied on May 9 and post-blossom sprays on May 30 and June 20. It may be observed that 1929 was not a bad Apple Scab year.

These figures clearly show that Bordeaux mixture, at 10 : 3 : 40, is a more efficient fungicide than lime-sulphur, 1 in 30 pre-blossom and 1 in 60 post-blossom, but the writers¹ remark that:—

"A noticeable feature in 1928 was that apples on the lime-sulphur plots were brighter and of a better colour than on the others, and this was commented upon by most of the growers who saw the plots when picking began."

Later, in the same paper, the authors state :—

“In comparing the relative values of Bordeaux mixture and lime-sulphur solution, it must be remembered that the latter will control Red Spider, which is becoming a serious pest in orchards that have been repeatedly tar-sprayed.”

Apart from the comparative merits of lime-sulphur and Bordeaux mixture, so well stated elsewhere,³ and although tar-distillate winter washes, which give a partial control of Red Spider, have now been included in the ordinary spray programme, the advantage of improved finish to the variety Worcester Pearmain,* resulting from the use of lime-sulphur, is not to be despised : the Wisbech growers appreciate it and would rather give additional applications of lime-sulphur on this variety than use Bordeaux mixture.

Assuming, however, that such an additional lime-sulphur treatment is to be given, the question then arises whether it is more beneficial to make it an extra pre-blossom, or a post-blossom, application.

M. H. Moore⁵ (East Malling), referring to Scab pustules on the twigs, states :—

“though this successional production of spores appears to be an argument in favour of the application of a spray previous to the ‘pink-bud’ stage (possibly in the ‘green tip’ stage), such an application has not been found necessary at East Malling.”

This supports the 1928 spray programme carried out in the Wisbech area on Worcester Pearmain. On the other hand, R. W. Marsh (Long Ashton)⁶ gives evidence of the excellent control of Apple Scab in the Bristol Province when fungicides were applied at (a) “green-flower,” (b) “pink-bud,” and (c) “petal-fall” stages only. His work emphasizes the importance of the extra pre-blossom application at the “green-flower” stage.

All the problems connected with apple growing in the Wisbech Fens are peculiar to the district, and Scab control is no exception. The trees are closely planted ; a high water-table induces abnormal vegetative growth ; the grass undergrowth, more often than not, is quite out of control ; and the “bottom ventilator” of the orchard, becoming half-shut in early June, is clogged with excessive transpiration moisture—conditions shown by K. H. Johnstone⁷ to be very favourable for Scab. Therefore, while the Wisbech rainfall† is more

* Salmon, Goodwin and Ware⁴ found that lime-sulphur did not give an extra finish to the variety Allington Pippin.

† The 1931 rainfall figures, in inches, were : East Malling, 23.56 ; Wisbech, 25.2 ; Bristol (Long Ashton), 33.04.

comparable with that of East Malling than with that of Long Ashton, Marsh's results in the West of England should not be dismissed without trial.

Trials in 1931.—In 1931, through the courtesy of Mr. A. Shuker, three blocks, each of eight trees (variety Worcester Pearmain) were taken over; they had been the unsprayed controls in the experiments of Petherbridge, Dillon Weston and Kent already cited.

The trees were about 25 years old, 18 ft. high and of 20 ft. spread, growing in grass at 24 ft. by 22 ft. centres. The three blocks, sandwiched between other plots of Worcester Pearmain, were treated with lime-sulphur at 1 in 30 for pre-blossom and 1 in 60 for post-blossom applications, as follows:—

Plot 1.—Two pre-blossom applications at (i) "green-flower" and (ii) "pink-bud" stages, with two post-blossom applications at (iii) "petal-fall" and (iv) two or three weeks later.

Plot 2.—Unsprayed throughout.

Plot 3.—One pre-blossom application at (ii) "pink-bud" stage, with two post-blossom applications as for Plot 1.

The trees had been winter-sprayed with a standard tar-distillate wash, and, apart from the fact that three trees in Plot 3 showed signs of damage by this winter spray, they were fairly uniform. Arsenate of lead was added for the "pink-bud" and "petal-fall" applications, and all the washes were applied through one lance, with a medium-size nozzle, from a hand-power, barrow-type machine belonging to the County Demonstration Plot. The dates of application were:—

i "Green-flower"	..	..	April 29
ii "Pink-bud"	..	..	May 12
iii "Petal-fall"	..	..	May 29 (rather late)
iv Second post-blossom	..	..	June 19

Weather conditions were not always of the best for spraying purposes; indeed, it was not possible to spray properly for several days just before June 19, on account of the force of the wind. Well-developed patches of Scab were seen on May 13 on leaves of Bramley's Seedling near Wisbech, and Scab was first observed on the young leaves of the control trees (Plot 2) on May 21. By June 1, the unsprayed Worcester Pearmain were badly infested, and observations in the neighbourhood suggested the advent of one of the worst Scab years on record. On June 17, one Scab-infected leaf was found on Plot 1, and the disease was then present on Plot 3. More Scab was observed on both these plots on June 19, and the unsprayed Plot 2 had a very severe attack. Scabbed fruit was observed on June 26, several apples being attacked on Plot 3 and one on Plot 1.

The weather had continued favourable for Scab development. The last six days of April brought a regular fall, rain was recorded on 22 days in May (traces only on 8) and, what appeared to be important to the experiment, there was a good fall in August, 3.36 in. being registered as the total for the 21 days on which rain was recorded (traces only on 8).

Results.—The fruit was picked on August 25, all of it being graded for Scab into three categories: (i) entirely free; (ii) pin-spot; (iii) bad and bag apples (total Scab spots over the size of a sixpence). The results are given in Table I.

TABLE I

<i>Spray Treatment (applications)</i>	<i>Weight of crop lb.</i>	<i>No. of apples</i>	<i>Scab : percentage number of Fruits</i>		
			<i>En- tirely free</i>	<i>Pin- spot</i>	<i>Bad and bag</i>
<i>Plot 1.</i> —2 pre-blossom and 2 post-blossom	562	2,320	32	46	22
<i>Plot 2.</i> —Unsprayed	52	275	0	17	83
<i>Plot 3.</i> —1 pre-blossom and 2 post-blossom	223½	1,315	15	46	39

Too much importance must not be attached to the difference in yields between Plots 1 and 3, for, while there was no very apparent difference in the quantity of blossom, bud damage had been caused to three trees on the latter plot through a winter tar-distillate wash, and the weights were not strictly comparable.

The difference in the percentages of fruit entirely free from Scab on Plots 1 and 3 leaves no doubt whatever of the value of the extra pre-blossom spray applied in the "green-flower" stage to Worcester Pearmain under the 1931 conditions prevailing in the Wisbech area. The percentage marketable on Plot 1, however (32 entirely free, plus 46 pin-spot), certainly leaves room for much improvement; but it must be borne in mind that the trees had not been sprayed for Scab control in three of the four preceding years.

Trials in 1932.—It was not possible to continue the experiment on the same trees that had been used in 1931, but, for the 1932 trials, Mr. A. Morton kindly allotted 24 Worcester Pearmain trees standing within a short distance of the 1931 Plots. These trees, half-standards, eight years old, were in a single row, planted 18 ft. apart on cultivated land. They were about 12 ft. high with a spread of 8 ft., and furnished a rather different spraying proposition from the trees of the 1931 trials. The previous treatment had been uniform throughout, but it was stated that the trees had been somewhat

neglected in the summer spraying programmes and that they suffered heavily from scabbed fruit every year.

Four sets each of six trees were sprayed as follows :—

Plot 1.—Unsprayed.

Plot 2.—Two pre-blossom applications, at (i) “green-flower” and (ii) “pink-bud” stages, respectively, with two post-blossom applications at (iii) “petal-fall” and (iv) two or three weeks later, respectively.

Plot 3.—Two pre-blossom applications (as for Plot 2) followed by one post-blossom (iii “petal-fall”) application.

Plot 4.—One pre-blossom (ii “pink-bud”) with two post-blossom applications (as for Plot 2).

Lime-sulphur was used, at 1 in 30 for the pre-blossom, and at 1 in 60 for the post-blossom, applications, the same apparatus and method of spraying being used as in 1931. The dates of the spraying operations were :—

“Green-flower”	..	..	May 9
“Pink-bud”	..	..	May 19
“Petal-fall”	..	..	June 6 (about two days late)
Second post-blossom	..	..	June 15

The floral development of the trees on these dates was rather backward compared with corresponding stages on other Worcester Pearmain trees in the district.

The weather conditions were again very favourable for Scab development. Rain was recorded on the last four days of April (traces only on two), on each of the first seven days of May, and on every day from May 9 to 31, inclusive (traces only on six days). During the first fortnight of June rain was recorded on eight days (traces only on three). On May 3, Scab was abundant on the leaves of a neglected tree about three miles away, and, on May 4, it was found on leaves of an *Emneth Early* tree (“green-flower” stage) in an orchard where Scab control had been efficiently carried out the previous year. It was first observed on the experimental control trees on May 31, and by July 1 was very bad on the young fruit of these trees, while a small quantity was also noted on some leaves in Plot 4. The other plots were free on that date, but Scab developed on the trees in them during the following week. A marked difference was noticeable in the incidence of Scab on the foliage in Plot 4 compared with Plots 2 and 3.

Early autumn gales caused a substantial fruit drop, but the windfalls were graded for Scab and added to the results obtained when the crop was picked on September 7. The fruit was classified in four grades: (a) entirely free from Scab; (b) “pin-spot”; (c) bad (aggregate spots more than the size of a threepenny piece and under the size of a shilling); and (d) bag. The results are given in Table II.

TABLE II

Scab : Percentage number of Fruits

<i>Spray Treatment (applications)</i>	<i>Weight</i>	<i>No. of</i>	<i>En- tirely</i>	<i>Pin- spot</i>	<i>Bad</i>	<i>Bag</i>
	<i>lb. oz.</i>	<i>Apples</i>	<i>free</i>			
<i>Plot 1</i>						
Unsprayed ..	2 13	38	0	16	13	71
<i>Plot 2</i>						
2 pre-blossom						
2 post-blossom ..	32 3	227	71	18	6	5
<i>Plot 3</i>						
2 pre-blossom						
1 post-blossom ..	34 13	198	64	30	3	3
<i>Plot 4</i>						
1 pre-blossom						
2 post-blossom ..	30 11	174	33	35	13	19

The figures again demonstrate the great value of the "green-flower" application to Worcester Pearmain in a bad Scab year at Wisbech. Other than an unknown lack of uniformity in material, or an extra infection from the adjacent unsprayed Plot 1, it is difficult to account for the slightly increased quantity of bad and bag apples in Plot 2 as compared with Plot 3. Figs. 1 and 2 show specimens of the graded apples from the 1932 trials.

The control trees (Plot 1) suffered severely from Red Spider, and the mite was undoubtedly a factor that helped the Scab to depress the yield. The trees on the other plots were all comparatively free from this pest, and their foliage maintained a different colour and appearance (Fig. 3). The increased return, both in quantity and quality of the crop, as the result of using lime-sulphur sprays, is obvious.

Summary.—Evidence obtained with the variety Worcester Pearmain, under 1931 and 1932 seasonal conditions at Wisbech, is given to show that the importance of an extra pre-blossom spraying (at the "green-flower" stage), indicated by the results of Scab-spraying trials in the west of England, should be taken into account in the spraying programme of the Wisbech area when lime-sulphur is used as a fungicide.

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¹ This JOURNAL, April, 1929, p. 45.

² *Annals of Applied Biology*, May, 1930, p. 417. *Proceedings of the Assoc. of Econ. Biologists*: "Apple Scab: Its Incidence and Control."

³ *Ibid.*, pp. 410, 411.



FIG.

ATLANTIC SEABOARD HERRING, 1932. SPECIMENS OF GRADED A1



Typical shoot from
Plot 1 (unsprayed)

[Photo - Turner - Welch]
Typical shoot from
Plot 2 (sprayed)

FIG. 3

⁴ *Jour. S.E. Agric. Coll.*, No. 28, 1931, p. 205. "The Control of Apple Scab. ii. Allington Pippin and Newton Wonder."

⁵ *Jour. of Pomology*, Vol. VIII, 1930, p. 235. "The Incidence and Control of Apple Scab and Apple Mildew at East Malling."

⁶ *Ibid.*, Vol. IX, 1931, p. 53. "Apple Scab Control in the Bristol Province: Field Trials, 1930."

⁷ *Ibid.*, Vol. IX, 1931, pp. 30 and 195. "Observations on the Varietal Resistance of the Apple to Scab (*Venturia inaequalis*, Aderh.), with Special Reference to its Physiological Aspects."

* * * * *

ALLOTMENTS

History.—It may not be generally realized that an allotment system has existed in England since feudal times. Its object, however, in these early times was different from that which prompts the movement nowadays. The lords of the soil, having an interest in obtaining as many tenants as they could—since their power was proportionate to the number of their retainers—portioned their estates into as many small allotments as the number of family tenants who could be found, receiving in return certain days of military or other service. When the feudal system was destroyed, the lords let their lands in a similar manner, receiving as rent certain amounts of labour from the tenant or produce of the land he held. As, however, it was no longer an object to maintain the number of their tenants, but rather to acquire an increased return of produce and to obtain a prosperous tenantry, no obstacle was thrown in the way of increasing the areas of farms, and a man obtained as much land as his means of cultivation permitted, or as he found to be profitable. These were powerful limitations, for money was scarce, and the agriculturists were chiefly tenants, labourers for hire being few.

In the fourteenth century occurred the agricultural revolution arising from the increased demand for wool and the consequent conversion of arable land into pasture to feed sheep. The small farms were now generally exterminated, the land proprietor becoming a great flock master. Comparatively few men were required under the new system as shepherds, and a large proportion of the small farmers became beggars who, as all records agree, infested England at this time. These conditions gave birth to the poor laws, and the reign of Elizabeth was the era of an effort to remedy the evils that had arisen from this destruction of small farms. Though the tenants of the small farms had been poor, yet none of them were paupers. It was, therefore, thought that any mode of recurring to such a system must be beneficial; and

in accordance with this opinion an Act of Parliament was passed, commanding that to every new cottage that should be erected four acres of ground should be allotted. It is not surprising that this first suggestion of the modern allotment system should have been of very limited operation. The quantity of ground allotted was too large, and owing to its interference with the liberties of the landed proprietors this Act was repealed in the eighteenth century. As, for various reasons, the value of all farming produce increased, the profits becoming commensurately larger, cultivators required more extensive farms, consolidation proceeded, and in 1709 the first Inclosure Act was passed. From that time the small occupiers gradually further diminished as their right of commonage, etc., was taken away by some thousands of Inclosure Bills that were enacted.

When the small farmers were deprived of their holdings they became for the most part agricultural labourers. It became a subject of great political importance, therefore, to ascertain how their character and comfort could be promoted, and the allotments system was one of the means adopted to that end. During the early part of the last century the system was introduced in a number of rural parishes by estate owners.

While small holdings have always been the subject of some controversy, there has been little or no difference of opinion as to the value of allotments, though it is on record that a proposal of Cobbett to the vestry of Bishops Waltham that the Bishop of Winchester should be asked to grant an acre of waste land to every married labourer was defeated on the ground that it would make the men "too saucy," that they would "breed more children" and "want higher wages." From a different point of view, Malthus argued that the provision of allotments would only result in still worse overpopulation, and John Stuart Mill believed that they would depress wages. On the other hand, Arthur Young was an enthusiastic advocate of allotments, and he prepared a grandiose scheme for spending 20 millions sterling in setting up half a million families with allotments and cottages. He was particularly in favour of giving cottagers enough land to enable them to keep some live stock, and he declared that "a man will love his country the better even for a pig." At the time, his words fell on deaf ears, and it was not till the Poor Law Commission of 1834 made a thorough inquiry into the whole question that there was an official endorsement

of the policy of supplying allotments in the form of small areas of land, not exceeding half an acre, that could be cultivated by a working man in his spare time.

From then onwards allotments were steadily developed in the agricultural areas, mainly by public-spirited land owners. Before the Local Government Act, 1894, which established parish councils and empowered them to provide allotments, only 2,249 acres were acquired by local authorities, but the Act gave a great stimulus to the movement, and from 1894 to 1902 18,600 acres were acquired, of which parish councils were responsible for 15,300 acres, providing over 30,000 allotments.

It may be interesting to note the opinions that were expressed, as follows, by some writers in the early days of the development of the modern allotment system :—

Mr. Estcourt's Account of the Establishment of Allotments in a Rural Parish (Communication to the Board of Agriculture, 1805)

After describing the results of an effort to better the condition of the poor in a country village by the provision of a small quantity of arable land for each family, the writer observes : " Some persons have conceived that inconveniences would arise out of this from circumstances of their being in a better situation in life than formerly, that it would put them above the necessity of labour, and would render them idle, insolent, and immoral ; to which it may be answered that, having given up all claim to parochial relief, they feel themselves obliged to look forward and to provide against occasional distress, which stimulates them to increased industry and economy ; besides which, if, with a numerous family, by the occupation of $1\frac{1}{4}$ acres of land only, they could obtain more than a bare sustenance it must be by a very superior exertion and frugality ; it is not likely that what is so obtained will be spent by the same person in vice and extravagance, in fact three years' experience proved to the contrary."

A Clergyman writing in the " Christian Observer " in 1832 with reference to an Allotment Experiment says :—

" The advantages attending this system (i.e., of allotments not exceeding a quarter of an acre), besides the comfort of the poor man, are the diminution of the Poor's Rate and the moral improvement of the labourer. Since this plan has been in operation the Poor Rate has been steadily declining from about £320 to about £180 per annum, with the prospect of still further diminution. When the farmer's work is scarce the poor man finds profitable employment on his plot of ground, which if he had not to occupy him he would be sent to idle upon the roads at the expense of the parish. The system has the further, and very important, effect of improving the character. When the labourer has his little plot of ground, from which he feels he shall not be ejected as long as he conducts himself with propriety, he has an object on which his heart is fixed ; he has something at stake in society ; he will not hang loose on the community, ready to join those who would disturb it ; so much so that in the late riots no man in the parish showed any disposition to join them."

As early as 1823 the Necessity for Organization was recognized.

An article in an East Anglian paper pointed out the difficulties in the way of the extension of the allotment movement, and suggested as a

means of overcoming these the establishment of societies. The writer says: "Let central and branch associations be formed immediately in every large town and its surrounding neighbourhood. Such associations regularly organized will collect information, digest plans, and stand ready to embrace every eligible opening for engaging land. Especially when farms become vacant and are about to be re-let it may be hoped that such associations will find little difficulty in inducing the proprietor to set off 10 acres out of 500 for the use of the poor, seeing that the rent is guaranteed by a respectable association, which will kindly come between the landlord and the labouring occupier and collect it by instalments or in small sums and be answerable for deficiencies.

If two respectable individuals would unite with zeal in attempting to establish such central associations, they could not but succeed. Let them look round and invite half-a-dozen persons like-minded and form at once a provisional committee. The way would then gradually open before them, and their exertions would entitle them to be ranked among the best benefactors of their country. Let the motto of a successful doer of good be adopted 'Begin directly and never give it up.' "

Another Article at about the same date describes an Allotment Experiment at Britlington on the Essex coast

"At the above-mentioned period, the moral and physical circumstances of the parties are described to have been of the most wretched description; their earnings being generally spent at the ale-house, and when the fishing was prosperous they never thought of saving any part of their earnings; in consequence, when the fishery, being their only resource, in any ways failed, their condition was truly pitiable: even a profession of religion was scarcely recognized among them. Their abodes were miserable in the extreme; in fact, they could scarcely be said to enjoy the comforts of civilized society."

"After entering upon their little allotments of land, having been instructed how to manage it to the best advantage, a spirit of emulation sprang up among them. They began to perceive what benefits might be derived from the cultivation of the soil during those hours which formerly had been spent in dissipation, or wasted in idleness. By these means they not merely saved the money wasted in spirituous liquors, but realized a considerable sum by their industry, as well as health from their salutary employment. The Lord's day is now observed by them; a place of worship has been erected; and those individuals whose feet never before trod the floor of a place of worship, now rejoice at the sound of a church-going bell; a day-school has been established, in which, as well as in a Sunday-school, their children are trained to industry, virtue, and religion. They are now comparatively neat and clean in their persons, their houses exhibit a greatly improved system of domestic economy, and it is a delightful scene to those who knew them thirteen years ago, to see them on an evening busily occupied in their little plots, and vying with each other who shall produce the best crops of cabbages, potatoes, grain, etc., and who can rear the finest pigs."

Modern Legislation.—In 1908 was passed an Act (the Small Holdings and Allotments Act, 1908) which consolidated previous legislation on the subject of allotments, and introduced new provisions. It imposed on local authorities the duty of providing allotments wherever there was a demand, and gave them power to acquire land compulsorily for the purpose by hiring or purchase, subject to confirmation by the Government Department concerned, if they were unable

to acquire suitable land on reasonable terms by agreement. It also gave them power to improve and adapt land acquired for the purpose. Other provisions related to the compensation payable to allotment holders on the determination of their tenancies, and the establishment of committees of local councils for dealing with allotment matters.

The Allotments Act, 1922, had a much wider application than previous allotment legislation. The growth of the demand for allotments in urban areas, which was stimulated during the War, made the question of the provision of land for the purpose one of vital importance. The Act restricted to some extent the control of their property by urban land owners, in view of the national importance of providing garden plots for dwellers in such districts. The principal new provisions of this Act, as amended by the Allotments Act, 1925, deal with the tenure of allotment gardens* and the compensation payable to tenants on the determination of their tenancies. They provided for a notice to quit of not less than six months, expiring out of the cropping season, except in certain cases for building or public purposes, where the notice required is usually three months. No compensation is recoverable by tenants of allotment gardens quitting under the six months' notice, but otherwise they are entitled to compensation for the crops growing on the land and the unexhausted value of manure. Tenants of the larger type of allotment are entitled to compensation on a wider basis. The Act of 1922 also provides that the rent to be charged for allotment land by a council shall be the full fair rent for such use. The price or rent paid by the council for the land does not, therefore, affect the rent to be charged. This provision is important in view of the demand for allotments in urban areas, and the high cost of land in such districts. The Act of 1925 requires town-planning authorities to consider the question of the provision of permanent allotments in town-planning schemes, and provides that where land has been purchased by a council for allotments it shall not be used for other purposes without the consent of the Minister of Agriculture and Fisheries. Various amendments to the existing statutory provisions were also made by the two Acts mentioned above.

Under the Local Government Act, 1929, agricultural land

* An allotment garden means "an allotment not exceeding 40 poles in extent which is wholly or mainly cultivated by the occupier for the production of vegetable or fruit crops for consumption by himself or his family."

ceased to be liable to assessment for local rates and allotments shared in this benefit.

Number and Acreage of Allotments.—The latest figures available show that the total area under allotments in England and Wales is about 146,000 acres, on which there are some 965,000 plots. Of this acreage nearly half is provided by local authorities. If we assume an average of three children to a family it will be seen that not far short of 5,000,000 people derive benefit from a supply of fresh vegetables, etc., which in many cases they could not otherwise afford.

Allotments in the War.—The greatest extension of the allotment movement, however, came during the War. For the purpose of maintaining the food supply of the country, the Boards of Agriculture in England and Scotland obtained powers, under the Defence of the Realm Regulations, to enter on land for the purpose of arranging for its cultivation. These powers were delegated by the Cultivation of Lands Orders to the urban local authorities, and the response made to the Government's appeal to produce food from allotments, and thus assist in defeating the enemy, was immediate and universal. All classes took up allotments, although many of the cultivators had previously taken little or no interest in the cultivation of land. No reliable figures as to the number of allotments created during the War are available, but it is estimated that, in 1920, the number had arisen to 1,330,000. In the words of the Right Honourable R. E. Prothero, now Lord Ernle, in 1918, "allotment holders have produced cabbages from concrete and broad beans from brickbats."

Allotments in Urban Areas.—The effect of the creation during the War of a large number of allotments in the towns and cities has been to transform the allotment question into an urban rather than a rural one. Under the conditions prevailing in heavily-populated districts the chief problem is naturally the difficulty of obtaining land for permanent allotments at a price which could be considered reasonable for the purpose. The Allotments Act, 1925, as amended by the Local Government Act, 1929, empowers urban authorities to acquire land up to such price as, with the cost of adaptation and other expenses, might reasonably be expected to exceed the receipts by no greater amount than would be produced by a rate of $1\frac{1}{2}d.$ in the £. There is, however, no obligation on authorities to avail themselves of this

provision, and it is usually found that a considerable proportion of council allotment land is rented from the owners. In this instance, the chief drawback is the lack of security of tenure. The Allotments Act, 1922, affords some protection against the determination of tenancies without reasonable notice in the case of allotment gardens, which comprise the vast majority of allotments. The effect of these provisions generally is to enable the tenant to harvest the crops which he has grown, or, alternatively, to be compensated for their loss. The principal risk to which allotment holders in urban areas are exposed is that the land may be required for building purposes, and, in most leases of land for allotments in such areas, a clause is inserted providing for resumption of possession at three months' notice for building purposes, as allowed under the Act of 1922. In such cases, compensation is recoverable by the tenants for the growing crops and the unexhausted value of the manure. No compensation, however, is recoverable in respect of allotment gardens for fruit trees and bushes or for tool sheds or greenhouses, which are often not in a condition to be moved safely.

Security of Tenure.—There is probably no absolute security of tenure for allotment holders, except by purchase of the land by the holders themselves, through an association or otherwise. Relative security can be obtained by a long lease without a resumption clause (see above) or, preferably, by purchase of the land by a local authority for the purpose of allotments. In the latter event, the plot holders have the protection of Section 8 of the Allotments Act, 1925, as amended by the Agricultural Land (Utilization) Act, 1931, which provides that where a local authority has purchased or appropriated land for use as allotments "the local authority shall not sell, appropriate, use or dispose of the land for any purpose other than use for allotments without the consent of the Minister of Agriculture and Fisheries, after consultation with the Minister of Health, and such consent shall not be given unless the Minister is satisfied that adequate provision will be made for allotment holders displaced by the action of the local authority or that such provision is unnecessary or not reasonably practicable."

Future of Allotments.—The future of the allotments movement is not at the moment clearly indicated. On the one hand, the attractions of the cinema and various forms of entertainment and recreation are becoming increasingly available to all

classes, and the extension of rural omnibus services, offering facilities to villagers for visiting the towns for shopping and entertainment, are exerting an adverse influence on the movement in both urban and rural districts. It is commonly experienced that while the older men continue to cultivate their allotments as long as they are able to do so, the young men do not come forward in the same numbers to take their places. There is thus a gradually diminishing interest in allotments throughout the country as a whole. On the other hand, there are not wanting signs of a revival of interest in the cultivation of the soil on the part of town-dwellers ; in thickly populated districts there is usually a waiting list of applicants, and it is still true that the amount of suitable land that can be provided in such districts often falls far short of the latent demand, which remains unexpressed on account of the apparent hopelessness of sufficient plots being provided. The difficulty of providing land in such places naturally increases as building proceeds. It is conceivable, however, that cheaper and quicker travelling facilities may enable town-dwellers to take allotments much farther out than has been usual. Such a plan would be particularly valuable to unemployed persons for whom there is no immediate prospect of work, if arrangements could be made for providing free travelling facilities for so many days per week, as the whole of such days could be spent on the allotments.

Modern housing tendencies, however, seem to point the way towards a gradual solution of the allotment problem. Even the cheapest houses built nowadays are provided with a garden, and in municipal housing schemes the garden approximates in size to that of an ordinary allotment garden. The general tendency on the part of town populations to move to the outskirts and to live in the new houses now being built gives ground for hope that, with a garden at the back door of every such house, the cultivation of vegetables, fruit and flowers for home use will become more general than ever before, and that the allotment problem, as it exists to-day, may at least become of less urgency.

Allotments for the Unemployed.—During the last few years interest has been aroused in proposals to provide allotment gardens for unemployed persons, with the special object of the moral and physical improvement which, as is shown by experience, results from such a healthy occupation. The

plan began with an effort made by the Society of Friends in 1928 to revive, in the South Wales mining districts, the allotments that had fallen into disuse and become derelict owing to the inability of the occupiers to pay their rents and supply themselves with the necessary seeds and manure. The movement spread during the following two years, and, appreciating the results obtained, the Government took over the work for the season of 1931, and appointed a Committee, under the Chairmanship of the late Sir William Waterlow, to administer funds that had been provided by a special vote of Parliament for the purposes of the scheme. As a result of the efforts of this Committee some 64,000 unemployed plot holders were provided with seeds, fertilizers and implements at very low prices.

In August of that year, however, the Government decided that in view of the paramount necessity for economy in national expenditure it could not continue to provide funds for this purpose. In order that unemployed holders of allotments should not be left entirely without assistance in obtaining seeds, etc., the Society of Friends issued a public appeal for funds to carry on the work, and as a result they were enabled to continue this form of assistance in 1932. The funds subscribed, however, were insufficient to allow the work to go on unchecked, and the Government have recently decided to make a grant on a *pro rata* basis to supplement private effort; with this help it is hoped to assist a larger number of unemployed plot holders.

The idea has received support from all political parties, and there is no question of the beneficial results obtained, both morally and physically, and the displays at various horticultural shows testify to the excellent results that can be obtained by unemployed miners and other industrial workers; while as regards the material results, the abundance of fresh vegetables that may be produced from an allotment garden must have a marked effect on the health of the family, who would in most cases, but for the allotment, have to go short of such food.

THE EFFECT OF LIME ON PASTURES

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THE value of liming has been recognized by farmers for centuries past, and many of the underlying reasons for that value have been explored and substantiated by scientific workers. The sweetening effect, for instance, on soils too heavily supplied with organic matter, the release of plant food from the latter as well as from the inorganic constituents of the soil, and the physical benefits that follow a heavy dressing of lime on clay—all these have been known and utilized since the very early days of farming. There followed the recognition of calcium as one of the chemical elements essential to plant life, and, more recently, studies of the effects of soil acidity and base exchange in soils have furnished additional evidence of the very great importance of lime in farm practice.

The benefits due to liming, however, have always been more striking in experimental work with arable crops than with grass land, and although one is always safe in recommending the inclusion of lime in any scheme of manuring for an arable rotation, unless it be concerned with one of the limestone soils, the results of liming experiments with pasture have not generally been so convincing. This is no doubt partly due to the difficulty of measuring the effect in a satisfactory way; that is, of putting the result into figures, since the grass is not harvested at one time, and cannot, therefore, be weighed. Attempts to overcome this difficulty have been made by resorting to the method of recording live-weight gains of animals grazed on the pasture; the classical experiments at Cockle Park, perhaps the best examples of this method, furnish strong corroboration of the visual evidence of pasture improvement due to basic slag treatment. As far as the effect of lime alone is concerned, however, the Cockle Park experiments, in common with most other similar experiments carried out in this country, are not nearly so convincing. They seem to show that lime by itself is very slow to act, and does not give spectacular gains, even though in theory there is an urgent need for lime in the soil. Indeed, they leave a doubt whether the liming of pasture should be recommended at all as an economic measure, except possibly in extreme cases such as moorland, or in industrial areas.

Corrie, in his useful little book, *Lime in Agriculture*, refers to an experiment at Sawley (organized by the Royal Agri-

cultural Society of England) that demonstrated that considerable improvement of grass land, in appearance and in feeding value (as measured by live-weight gains of cattle and sheep), could be brought about by liming and slagging ; but neither the effect of lime alone nor the question of the economic return appears to have been studied in this instance.

The influence of lime on the yield of meadow hay has been investigated at Rothamsted, Cockle Park and elsewhere, but though the crop is of the same type, the problem of pasture is really quite distinct. It may, however, be of interest to mention that at Rothamsted, from 1924-28, the Permanent Hay Plots showed the following average increases due to lime :—

With no other manure . .	1.21 cwt. per acre (= 11 per cent.)
With other manures . .	1.76 „ „ (= 16 „)*

Striking instances of the improvement of pasture by liming, however, are rather the exception than the rule, and in our own manurial experiments with pasture in Cheshire we have generally not been able to note any marked effect attributable to lime, even on fairly acid soils, until at least three years after beginning the trial.

The view most commonly accepted to-day, perhaps, is that liming of grass land is a very useful, if indeed not essential, basis for encouraging the response of the herbage to the action of other fertilizers. For example, one generally expects better and more lasting results from nitrogenous manures if the land has previously received a basal dressing supplying lime ; this basal dressing is even regarded as essential in the so-called intensive system of grassland management.

The traditional view of the value of liming of pastures, however, remains difficult to substantiate, and there seems to be a need for further experimental evidence to prove to the grassland farmer that money spent in this way really does give an economic return under normal farming conditions.

Great progress has recently been made in this direction by workers at the Rowett Institute, at Cambridge and at Aberystwyth, who, by drawing attention to the very considerable variation in *quality* of different samples of pasture grass, have begun a new chapter in the history of agricultural research.

In connexion with the influence of mineral content on the nutritive value of pasture much work has recently been

* See Ministry of Agriculture Bulletin No. 28, *Artificial Manures* (Second Edition), p. 72.

done, and a comprehensive summary of the knowledge so far acquired is to be found in Dr. J. B. Orr's book, *Minerals in Pastures*, published in 1929. A great deal is now known of the importance of mineral matter in the prevention of diseases like rickets, osteomalacia and bent leg, which are direct affections of the bony tissues of animals; but, in addition, there are strong grounds for suspecting that constitutional diseases such as tuberculosis, Johne's disease and abortion may not be unrelated to mineral deficiency. That this is true for farms in a county like Cheshire, from which vast quantities of lime and phosphoric acid are annually exported in the form of milk or cheese, seems more than likely, unless adequate compensating returns are made to the soil in the shape of artificial manures.

The most conclusive evidence on the subject of the relationship of mineral deficiency to constitutional weakness or disease is afforded by an experiment conducted by Orr and others, and described in the *Scottish Journal of Agriculture*, Vol. VIII. In this experiment, two groups of Ayrshire cows were similarly fed and housed throughout two complete lactation periods, except that one group received a mineral supplement with the compound cake supplied.

The mineral group showed a positive improvement over the non-mineral group in respect, not only of milk yield and the live weight of the calves thrown in the second year, but also in resisting tuberculosis, for all six passed the tuberculin test each time it was applied, whereas three of the non-mineral group reacted—one suffered from several attacks of mastitis, and yet another showed symptoms of osteomalacia before the experiment concluded.

The exact requirements of the dairy cow are, unfortunately, not known with certainty, but it has been estimated by Continental workers that an average cow requires about $1\frac{1}{2}$ oz. of lime daily for maintenance purposes. According to the latest researches of Cranfield and others, a gallon of milk contains 0.29 oz. of lime, and since it would be unsafe to conclude that more than one-third of the total lime consumed by a cow is embodied in the milk substance, the following table indicates probably the minimum amounts of lime demanded for the given purposes:—

For a cow giving	Lime (CaO) required
1 gal.	2.37 oz.
2	3.24
3	4.11
4	4.98
5	5.85
6	6.72

The food capacity of the average cow is usually taken at 30 lb. of dry matter, though it is doubtful whether, in general, a cow at pasture would consume in the form of such a succulent food as grass the amount equivalent to this. It is interesting, however, to calculate upon this assumption the extent to which pasture grass of given lime content may answer to an animal's lime requirement. The following table summarizes the results of such calculations :—

<i>CaO content of grass per cent. (Dry matter basis)</i>					<i>Sufficient for maintenance and</i>
1.00	..	..	..	..	3½ gal.
.90	..	..	..	..	3½ "
.80	..	..	..	..	2½ "
.70	..	..	..	..	2½ "
.60	..	..	..	..	1½ "
.50	..	..	..	..	1 "

Recent work at Aberdeen, Cambridge and elsewhere has shown that, expressed in the dry matter of the grass, the percentage of lime (CaO) may vary from a figure as low as 0.25 per cent. to as high as 2.00 per cent., or over, depending upon the type of pasture and other factors, chief of which is the previous manurial treatment. An average figure for cultivated lowland pastures would be, say, 1.00 per cent., but it is important to note that there is a definite seasonal variation, as Cruickshank (*Jour. Agric. Sci.*, XVI) and other workers have clearly demonstrated, resulting in a gradual rise to a maximum usually in July or August. It is clear, therefore, that if the foregoing theoretical considerations are near to the truth, then there must be a considerable acreage of our cultivated pastures carrying herbage of a lime-content which can scarcely be considered adequate for the needs of heavy-yielding dairy stock, especially at the beginning and towards the end of the grazing season.

Fortunately, however, this danger can readily be overcome by manurial treatment. Thus, an increase in the mineral constituents—particularly lime—of pasture grass has been recorded by several observers, and forms the subject of a report by Godden (*Jour. Agric. Sci.*, XVI, p. 98), who finds, incidentally, that an increase in lime-content is usually accompanied by an increase in the percentage of nitrogen. Substantial increases in the mineral content of pasture grass, due to liberal manuring, have also been recorded in the 1929-31 trials conducted by the Pasture Sub-Committee set up by the Development Commission, and carried out at numerous centres (including Reaseheath) in Great Britain.

The average figure for lime and phosphoric acid (P_2O_5) during the 1930 trials, for example, bring out this fact quite clearly.

<i>Average Yield of CaO and P_2O_5 (lb. per acre)</i>					
	<i>No lime, no manure</i>		<i>Limed and manured</i>		<i>Gain</i>
CaO ..	38.1	..	..	73.8	252 per cent.
P_2O_5 ..	35.0	..	..	54.2	116 "

The lowest gains recorded were 11 and 9 per cent., while the highest gains were 1,911 and 460 per cent. for lime and phosphoric acid respectively. In view of the striking gains shown in the above table it should be remembered that the quantities of lime and of phosphatic manure applied to the grass plots in 1929 were very much in excess of those ordinarily used in farm practice.

There is thus no doubt that the mineral content of pasture can quite readily be substantially increased by manurial treatment, but perhaps it is not so generally appreciated that such an increase is by no means always accompanied by an improvement in the bulk of the herbage. The results obtained in the experiment described below seem to make this clear, at any rate so far as lime is concerned. It is important that the farmer should realize the fact that although, in many instances, the response to lime is very slow, and may not be at all apparent to the eye, yet lime is nevertheless effective, and will continue to influence the nutritive value of the herbage until, through removal by stock or by drainage, the supply has dropped to its original level.

Liming Experiments in Cheshire.—The original intentions that led to the carrying out of the experiments, now to be described, were as follows:—

(1) To obtain information on the effect of lime on various types of pasture in the County of Cheshire.

(2) To correlate, if possible, the response to liming with soil type as defined by certain laboratory tests upon the soils of the chosen pastures.

Outline of the Experiment: (a) *Field Work.*—Thirty-six plots were laid down in the summer of 1929 at various places throughout the county, each plot being 10×10 yards in area, on pastures that had not, as far as was known, received a dressing of lime for several years previously. One cwt. of best ground limestone (equivalent to approximately 50 cwt. per acre) was broadcast on the plot, and turves were taken out at the corners to ensure future location of the site. Soil samples, consisting of five borings down to 9 in., were obtained at the time of laying down. Each plot has been visited once

yearly—generally during June or July—for the purpose of trimming up the marking holes and for noting observations.

The figures that follow refer to 24 plots only, and it should, therefore, be explained that a change of farming policy, e.g., the ploughing up of the pasture, or its conversion to meadow, rendered a number of the original 36 trial plots no longer suitable for the purposes of the trial.

In 1932, samples of the herbage from 24 of the plots, and also from the area surrounding each of these, were taken by the method used by the Rowett workers and described by Godden (*Jour. Agric. Sci.*, XVI, p. 79).

(b) *Laboratory Work*.—The following determinations were made upon the soil samples taken from the plots as previously described, the object being to define as nearly as possible the "soil type":—

Loss on ignition; Moisture content at the "point of stickiness"; pH value*; lime requirement (Hutchinson-McLennan method). These figures are given in the following table for the 24 plots from which grass samples were taken in the summer of 1932.

TABLE I

Plot	Loss on ignition Per cent.	Moisture content at sticky point Per cent.	pH value	Lime requirement cwt. CaCO ₃ p.a.
1	4.53	18.7	5.96	8
4	10.42	31.4	5.02	53
6	11.58	35.6	5.10	52
8	8.63	31.0	5.10	40
9	7.68	26.3	5.14	42
10	8.93	22.3	5.19	50
11	6.96	25.7	5.03	34
12	10.92	35.6	4.23	74
13	8.08	30.6	6.12	18
14	8.13	31.4	5.49	33
15	9.89	31.7	5.08	43
19	7.70	27.8	5.34	31
20	8.12	29.3	5.15	39
21	7.96	29.0	5.26	24
22	10.13	31.7	5.61	17
23	13.43	43.5	5.03	64
24	9.92	31.3	5.35	32
28	11.94	34.2	4.76	80
29	9.58	28.3	5.42	36
30	18.00	44.0	4.96	82
31	11.80	30.5	5.74	40
33	14.85	40.9	5.28	57
34	9.46	31.2	5.55	28
35	9.04	28.0	5.03	38

* The author wishes to acknowledge his indebtedness to Dr. A. M. Smith, who was responsible for these determinations.

The above table shows that the types of soil chosen spread over a fairly wide range, though actually, with one or two exceptions, they would all be classified roughly as loams. Nevertheless, no difference in the nature or quality of the herbage due to the liming was apparent to the eye when the plots were visited in 1930, and even one year later, in 1931, only four out of the surviving 32 plots showed visible signs of any improvement. The improvement noted in these amounted to a slightly fresher appearance, with perhaps a little more clover than in the unlimed pasture surrounding it.

This improvement has been maintained up to the present year, and, in addition, six further plots are beginning to show slight signs of the beneficial effect of the lime applied three years ago. The delayed action was not altogether unexpected; indeed, as previously mentioned, it was quite in accord with previous manurial experiments in the county, many of which show that only after four or five years is there any noticeable improvement attributable to the lime, irrespective of the effect of any other manures applied during the period of the experiment. The ordinary method of judging by eye, however, can hardly be said to be anything but a rough guide, and it was felt that a more scientific measure of the effect should be sought.

Accordingly, the grass was sampled as described, and after drying and grinding, the samples were examined in the laboratory for the percentage of lime in the dry matter.

Table II gives the result of these determinations, together with the differences and percentage differences between the limed and the unlimed herbage in each case.

Before discussing these results in relation to the data given in Table I, it should be noted that the fields containing plots 24, 29 and 30 have been limed by the farmer during the past three years, i.e., since the plots were laid down, and that this would account for the small differences between the CaO contents of the limed and unlimed herbage on those plots. This particularly applies to Plot 30, which was the first of all to show any marked improvement in response to the liming, and which still shows up better than the rest of the field, despite the subsequent liming of the latter.

Unfortunately, the data in Table II do not lend themselves to a very close correlation with the soil figures in Table I. Neither the lime requirement nor the pH value taken separately appears to be a reliable index as to whether, in the case of pasture grass, a visible response to liming is likely

TABLE II

Plot	CaO in D.M. of untreated grass Per cent.	CaO in D.M. of limed grass Per cent.	Difference	Percentage difference
1	.810	.980	.170	+ 21
4	1.064	1.053	.011	- 1
6	.834	1.238	.404	+ 48
8*	.952	1.422	.470	+ 49
9*	.840	1.380	.540	+ 64
10*	.717	.818	.101	+ 14
11*	.846	1.254	.408	+ 48
12†	.963	1.372	.409	+ 42
13*	1.243	1.484	.241	+ 19
14	1.372	1.501	.129	+ 9
15†	1.170	1.683	.513	+ 44
19	1.098	1.456	.358	+ 33
20	.694	.991	.297	+ 43
21	1.350	1.502	.152	+ 11
22	1.086	1.176	.090	+ 8
23*	.672	1.081	.409	+ 61
24	1.266	1.249	.017	- 1
28	1.126	1.137	.009	+ 1
29	1.070	1.041	.029	+ 3
30†	1.277	1.344	.067	+ 5
31	1.053	1.411	.358	+ 34
33	.834	1.210	.376	+ 45
34†	.644	1.098	.454	+ 70
35	.980	1.131	.151	+ 15
Mean	.957	1.250	.293	+ 30

* Improvement noted in 1932.

† Improvement noted in 1931.

to follow. Taken together, however, the information obtained seems to show that a soil with a high lime requirement (say, over 50 cwt. CaCO_3 per acre) and a low pH value (say, below 5.20) will probably show lime response, as judged by the crude method of visual inspection of the herbage, within three years of the application of the lime, and possibly within two years.

Even this statement, despite its qualification of uncertainty, cannot be applied to one or two of the cases investigated. Plots 4 and 6, for example, appear to have undergone no change, even after three years, though both are distinctly acid soils with a moderate lime requirement. The outstanding case, however, is Plot 28, the soil of which is a sandy loam inclined to be peaty in the hollows; sand with peat forms the subsoil, and, at 3 ft., there is a bed of clay. It may well be that lack of adequate drainage is here the limiting factor to any improvement.

The only remaining case of interest is presented by Plot 34, which is situated in the heart of an industrial area suffering

from smoke pollution of the air, with the usual disadvantage of acid accumulation in the soil. Although, at the time of laying down this plot, the soil was not extremely acid, it is evident that the addition of the lime has had the effect of neutralizing subsequent acid accumulations, and that, in fact, this particular case is not so much one of response on the part of the grass within the plot as one of retrogression outside the plot. Apart from this rather unsatisfactory attempt at correlation, however, it is interesting to note that what may fairly be described as an ordinary farm dressing of lime has given the substantial average increase in lime content of the herbage of 30 per cent. in the third season, and will in all probability continue to exert a similar effect for several years longer. Considering the importance that is now being attached to the mineral side of nutrition, it may well be that such an increase will justify the outlay in an economic sense despite the lack of visible response.

Again, turning to Table II, we may perhaps be tempted to argue that the average figure for lime as shown therein is such that no general shortage of this material is likely to make itself felt, and that only under certain conditions is the danger a real one. It must be remembered, however, that the grass samples were taken at a time of the year when the lime content of the herbage was around its maximum, and the seasonal average would therefore be very much less. It may, in many instances, prove insufficient to meet the needs of a cow giving more than, say, $2\frac{1}{2}$ gal. of milk daily, a very modest figure for summer conditions in this country.

Is it not, therefore, reasonable to suppose that, in many instances, where a cow is yielding heavily, or the pasture is only of moderate mineral content (or both), the constitution of the animal must in time become greatly impaired? The argument, of course, could be applied with respect to phosphoric acid as well as lime, and a trial with basic slag on a number of the plots is being conducted, as from this year, for further observations.

The question is not one that can easily be answered, as it involves so many factors, both biological and chemical, that are difficult to separate; but the policy of occasional liming and slagging of pastures is one that, in these days of high milk-production, can scarcely fail to appeal to the wisdom of the dairy farmer.

THE CONTROL OF THE RASPBERRY BEETLE

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§ THE Raspberry Beetle (*Byturus tomentosus* F.) is the most destructive pest with which growers of loganberries, raspberries and blackberries have to contend. Where loganberries are severely attacked, most of the berries contain maggots or are deformed, and the crop is rendered practically valueless; and, with raspberries, where the maggots mostly remain on the plugs, the market returns are very small and sometimes nil. The large increase in the canning industry emphasizes the need for economic control measures of this pest.

Description and Life History.*—The adult beetles are about one-sixth of an inch long and of a brown colour. They are covered with hairs which are golden at first and later turn grey. When these wear off the beetles are dark brown.

They spend the winter in the soil, from which they emerge at the end of April or May, feeding on the unopened flowers by burrowing into their bases and also on the leaves at the tips of the new growth. They frequent the flowers as soon as they begin to open and as many as 12 may be found in a single blossom. They feed chiefly on the nectar in the groove around the young fruit, but also injure the developing fruitlets. They also frequent the flowers of the wild rose, hawthorn and apple. They fly readily in sunny weather.

The beetles are not usually found on blackberries until they have been present for some time on raspberries and loganberries. They persist until July on raspberries and loganberries, but may be present well into August on blackberries. Steer has shown that late larvae may not become adults for about 12 months, i.e., until the following September, and that they hibernate as beetles in the following winter.

Eggs are usually laid on the raspberry and loganberry in June, but a few are laid in July. They are laid much later on the blackberry. The eggs are elongate-oval, creamy white, smooth and shining, about one-twentieth of an inch long. If the fruit is examined with a lens, the eggs can readily be seen attached to the pistils or stamens. The eggs hatch in

* Further details concerning the life history may be found in "The Loganberry Beetle," by W. Steer, Annual Reports, East Malling Research Station, 1928, 1929 and 1930.

about 10 to 12 days and the resulting yellowish maggots grow until they become nearly one-third of an inch long. Steer has pointed out that the maggots feed for some time on the surface of the fruit before they bore into it. Eventually they make their way into the "plug" and feed on the surrounding fruitlets. When fully fed they drop or crawl to the ground and make a small earthen cell, mainly in the top two inches of soil, but some may be found at a depth of a foot. Here they live for just over a month, when they pupate. They live for rather more than a month as pupae and then change to adult beetles. The beetles remain in the earthen cells till the following spring.

Experiments in 1931.—Sprayings were planned on similar lines to those of Steer at East Malling, with the object of killing the maggots. They were carried out on Lloyd George raspberries belonging to Mr. Metcalfe, of Haddenham, in the Isle of Ely. Each plot was 15 yards long and 7 rows wide (width of rows 5 ft. 6 in.). Four plots were left untreated, and, on one plot, chickens were folded from the beginning of April. The Derris wash used was a proprietary preparation consisting of soft soap and powdered Derris and was used at a dilution of 1 lb. of Derris to 60 gal. of water.

The Pyrethrum washes used were proprietary articles, and were used at a strength reputed to be equal to 1 per cent. of the dried flowers. The applications were made with a barrow pump giving a pressure of 90 to 120 lb. per sq. in. Two lances, each carrying two fairly coarse nozzles, were attached to the pump, which was worked by one man.

Where the canes were thick, the spraying was at the rate of 460 gal. per acre, but in parts where the canes were fewer only 300 gal. per acre were necessary. From the time taken to spray these plots, it was estimated that one lance could spray an acre in eleven hours.

On *May* 28, many beetles were present, mostly feeding on the unopened flowers.

On *May* 30 a few blossoms were open.

On *June* 5, when 50 to 60 per cent. of the flowers were open, eggs were found in about 50 per cent. of these open blossoms.

On *June* 12, a few larvae were found and, on *June* 15, over 50 per cent. of the eggs had hatched.

On *July* 13 to 15, 1,000 raspberries were picked and graded from each plot.

Table I gives the details of the times of spraying and the percentage of damaged berries.

TABLE I.—LLOYD GEORGE RASPBERRIES

Treatment	Date of Application	Percentage of Damaged Berries
Soft soap and Derris (Proprietary)	May 30 and June 12.. ..	39.8
Ditto	June 5, June 12 and June 16	11.7
Ditto	June 12 and June 16 ..	19.8
Pyrethrum (2 solution) (Proprietary)	May 30, June 5 and June 12	27.4
Ditto	June 5 and June 12	47.0
Ditto	June 5, June 12 and June 16	9.4
Pyrethrum (1 solution) (Proprietary)	May 30 and June 12.. ..	63.5
Ditto	June 5, June 12 and June 16	49.0
Ditto	June 16 and June 19 ..	61.0
Chickens		70.3
Control		90.5
Control		87.8
Control		92.6
Control		88.4

Conclusions.—In these experiments, a good control was obtained with soft soap and Derris, and with a two-solution Pyrethrum wash when the spraying was done on June 12 (the date when the eggs began to hatch) and again on June 16, but poor results were obtained with the one-solution Pyrethrum. Folding with chickens gave a reduction of about 20 per cent. in the number of infested berries.

Experiments in 1932.—In these experiments, it was decided to drop the use of Pyrethrum sprays on account of their high cost as compared with Derris, and to include a spray consisting of soft soap and nicotine sulphate in the spraying programme. Some experiments were also planned to study the effect on the adult beetle of dusting with Derris powder.

Analyses carried out in December, 1932, to determine the rotenone content of samples of the Derris preparations used in these experiments gave the following figures :—

Derris powder used in spraying	(a) 2.16 per cent. rotenone.
	(b) 2.19 per cent. rotenone.
Derris dust used for dusting	(a) 0.21 per cent. rotenone.
	(b) 0.20 per cent. rotenone.

(1) *In the Isle of Ely.*—Here, a soft soap and nicotine sulphate spray, substituted for the Pyrethrum wash, was tried on Lloyd George raspberries belonging to Mr. Green, of Wilburton.

Each sprayed plot (plots were in duplicate) measured ten yards long and was six rows wide (width of row 6 ft.). The four control plots were three rows wide and of a similar length.

The applications were made with a petrol engine pump giving a pressure of about 100 lb. per sq. in. at the first spraying and about 160 lb. per sq. in. for the second spraying. Two lances, each carrying a fairly coarse nozzle, were used. The strength of the washes used was :—

Derris powder : 1 lb. in 50 gal. of water.

Nicotine sulphate : 10 oz. in 40 gal. of water.

On *June 20*,* when the first spraying was done, the water available was very hard and, consequently, a proprietary spreader was substituted for the soft soap which it had been the intention to use. For the second spraying, on *June 29*, a softer water was obtained, but as this required about 1 lb. of soft soap to soften 40 gal. of water, 5 lb. of soft soap was used for each 40 gal. of water. The spraying was done at the rate of one acre in $6\frac{1}{2}$ hours (two lances) and about 550 gal. were used per acre.

On *June 10*, when the raspberries were in full bloom, eggs had been laid in a large percentage of the blossoms.

On *June 20*, when the first sprayings were done, a few maggots had hatched.

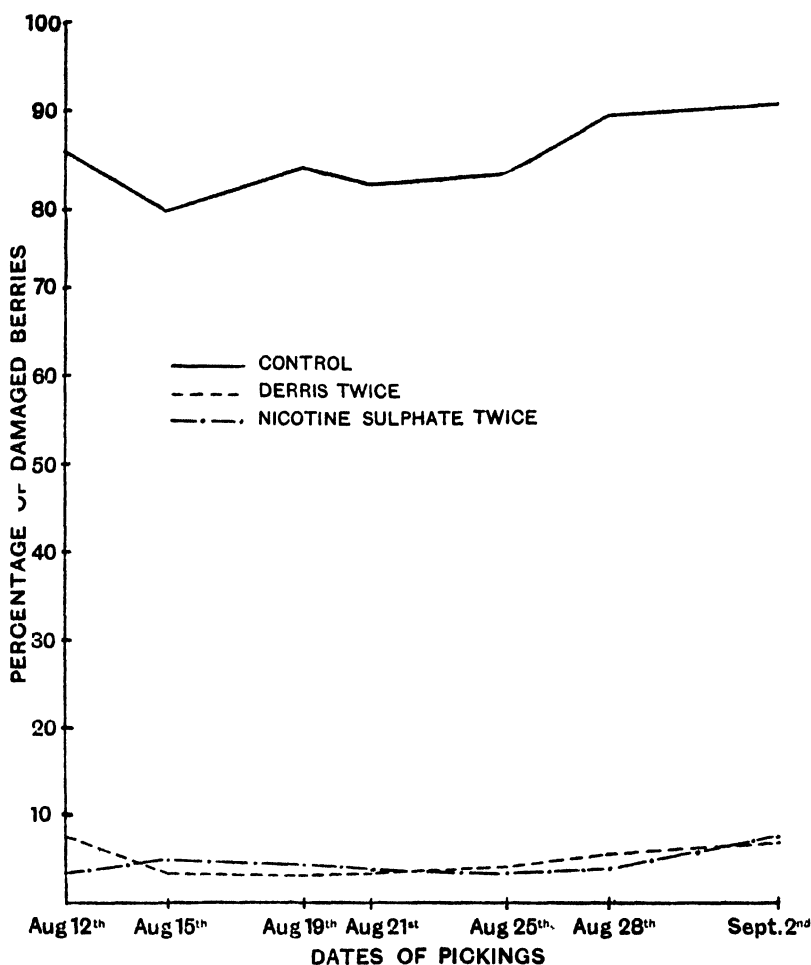
Seven pickings of the raspberries were made and on each occasion 200 berries were picked at random from each plot and graded. The results are summarized in Table II and Graph I.

TABLE II.—LLOYD GEORGE RASPBERRIES
Percentage of Damaged Berries

Date of Picking	Soft soap and Derris	Soft soap and nicotine sulphate	Unsprayed
July 12	7.7	3.5	85.4
July 15	3.5	5.0	78.6
July 19	3.3	4.5	83.8
July 21	3.5	3.8	81.9
July 25	4.0	3.8	83.3
July 28	5.3	4.0	89.9
Aug. 2	7.3	7.5	90.9
<hr/>			
Average per cent. infestations ..	4.9	4.6	84.8

The raspberries from the different plots were all weighed separately except at the last picking. The sprayed plots showed an increase of 20 per cent. in weight per acre over the unsprayed plots. The weight of clean raspberries was increased seven times by the spraying. The crop from the unsprayed canes was of little market value, whereas the raspberries from the sprayed plots made a good price.

* The season of 1932 was a very late one, and in normal seasons June 10 is approximately the date when the first spraying should be done.



GRAPH I.—Showing percentages of damaged raspberries after spraying with (a) derris and (b) nicotine sulphate.

Conclusion.—In these experiments both Derris and nicotine sulphate used with a spreader—in the first spraying a proprietary spreader, and in the second spraying soft soap—gave a very satisfactory control of the raspberry beetle.

(2) *In Essex.*—These experiments were carried out on raspberries belonging to Messrs. Carter & Blewitt at Boxted, and Mr. E. G. Dorey, of the East Anglian Institute of Agriculture, Chelmsford, assisted us in picking and grading the fruit. Each treatment was carried out on three separate half-rows of Lloyd George raspberries. The control plots were in the same rows as those sprayed and were about 13 yards long. The remainder of these rows were sprayed on June 13 by Messrs.

Carter & Blewitt with 2 lb. of lead-arsenate powder in 100 gal. of water. Our applications were made by Messrs. Carter & Blewitt's spraying staff with a petrol engine pump giving a pressure of about 150 lb. per sq. in. Two lances, each carrying a fairly coarse nozzle, were used, and the spraying was done by the usual spraying gang.

TABLE III.—SHOWING THE VARIOUS TREATMENTS USED AND THEIR TIME OF APPLICATION

Treatment 1	{ Lead arsenate 2 lb. of powder to 100 gal. of water.	{ June 13*
Treatment 2	{ Soft soap 10 lb. Derris 2 lb. Water 100 gal.	{ June 21 July 1
Treatment 3	Treatments 1 and 2.	June 21
Treatment 4	Soft soap and Derris.	June 24* July 1 July 4*

* Spraying by Messrs. Carter & Blewitt.

On June 21, when our first spraying was done, eggs were present on a large number of the berries and a few larvae were found.

Seven pickings were made and, at each picking, 100 berries were picked at random from each side of the canes. The percentage of damaged berries is shown in Table IV.

TABLE IV.—LLOYD GEORGE RASPBERRIES

Date of Picking	Percentage of Damaged Berries				
	Treatment 1 Lead Arsenate	Treatment 2 Soft soap and Derris powder (Twice)	Treatment 3 As (1) and (2)	Treatment 4 Soft soap and Derris powder (4 times)	No Spraying
July 14	40.7	5.2	—	—	75.7
July 16	43.8	15.6	6.0	—	90.3
July 20	33.0	11.9	6.5	4.0	86.5
July 22	39.3	11.7	12.0	3.0	91.0
July 26	53.0	7.2	9.7	5.0	93.0
July 29	53.3	12.5	15.3	6.3	90.8
Aug. 2	49.4	16.2	18.0	10.6	95.5
Av. percentage infested	44.6	11.5	11.6	5.8	89.0

In the same raspberry plantation, there were a few rows of the variety Devon. These were sprayed in a similar manner to the Lloyd George and gave the following results :—

TABLE V.—DEVON RASPBERRIES

Unsprayed	64.2 per cent. of damaged berries
Soft soap and Derris powder sprayed June 21 and July 1	6.2 per cent. of damaged berries
Soft soap and Derris powder sprayed June 21 and 24, and July 1 and 4.	3.3 per cent. of damaged berries

Conclusions.—Two sprayings with soft soap and Derris powder gave a satisfactory control of the raspberry beetle. Four sprayings gave a still greater control, but not sufficient to make more than two sprayings an economic proposition. One spraying with lead arsenate applied at full bloom reduced the number of damaged berries by nearly 50 per cent.

Experiments on Loganberries : (1) *In Essex.*—These were carried out at Messrs. Carter & Blewitt's at Boxted, and were planned on the same lines as described above regarding raspberries. Two of the soft soap and Derris plots were sprayed with knapsack sprayers at the first spraying, but at the second spraying all three plots were sprayed with a power sprayer.

TABLE VI.—SHOWING THE VARIOUS TREATMENTS USED AND THEIR TIME OF APPLICATION

Treatment 1	{ Lead arsenate. 2 lb. of powder to 100 gal. of water.	} June 13*
Treatment 2	{ Soft soap, 10 lb. Derris, 2 lb. Water 100 gal.	} June 21 July 1
Treatment 3	Treatments 1 and 2.	
Treatment 4	Soft soap and Derris.	Power sprayer June 21 Knapsack June 24* Power sprayer July 1 Power sprayer July 4*
Treatment 5	No spraying.	

* Sprayings by Messrs. Carter & Blewitt.

On June 21, when the first spraying with soft soap and Derris was carried out, eggs were present on a large percentage of the berries, and a few larvae were found.

Eight pickings were made and at each picking 100 berries were picked at random from each side of the canes. The percentage of damaged berries is shown in Table VII.

Conclusions.—Two sprayings of soft soap and Derris with a power sprayer gave a fairly good control of the raspberry beetle, but, where the first spraying was done with knapsacks, the control was not quite so satisfactory.

Four sprayings with soft soap and Derris reduced the percentage of damaged berries to 11.3. From this it would appear to be difficult to reduce a bad attack below 10 per cent.

TABLE VII.—LOGANBERRIES

Date of picking	(1) Lead arsenate	(2) Soft soap and Derris (twice)		(3) Lead arsenate and soft soap and Derris (twice)	(4) Soft soap and Derris (4 times)	No spraying
		A 1st spray with knapsacks 2nd spray with power	B Both sprays with power			
July 14	34.1	11.6	4.0	—	—	90.8
July 16	44.5	19.4	8.0	17.7	—	97.5
July 20	37.3	19.5	7.0	18.7	8.5	92.8
July 22	39.3	22.4	12.5	20.3	7.0	93.2
July 26	62.8	24.7	12.0	16.5	9.5	95.8
July 29	71.3	31.0	25.5	26.8	14.0	95.1
Aug. 3	75.0	43.7	30.0	40.3	25.0	97.7
Aug. 10	24.5	13.7	7.0	15.3	4.0	68.0
Av. per-centage damaged	48.6	23.3	13.3	22.2	11.3	91.4

with soft soap and Derris spraying. One spraying of lead arsenate at full bloom reduced the number of damaged berries by about 40 per cent.

(2) *In Huntingdonshire*.—These experiments were carried out on loganberries at Messrs. Chivers & Sons' plantation near St. Ives, and were on different lines from the previous experiment, a proprietary Derris dust being applied with the object of killing the beetles before egg-laying. The plantation was heavily infested, an average of about 30 beetles being found per plant. In 1931, the crop from these canes was of very little value owing to the ravages of the beetle.

On *May 30*, when a few flowers were open, a preliminary trial of the application of dusts was made in sunny weather with a knapsack duster.

An examination of the plants on the following day showed that most of the beetles had been killed and very few could be found on the dusted plants (a few of the beetles flew away during the application of the dust).

As a result of these preliminary trials, about one-half the plantation (i.e., $1\frac{1}{2}$ acres) was dusted by means of a barrow duster operated by hand, in sunny weather on *June 2*, when only a few flowers were open. It was rather windy at the time of dusting and about 3 cwt. of dust per acre were used, this amount being necessary to cover the whole of the plant satisfactorily. Another Derris dust with a lower percentage of Derris was tried at this date, but as it gave much inferior results to those given by the other it was discarded. With

the original dust, within an hour of its application, very few beetles could be found on the plants, but dead and dying beetles were found on the soil underneath.

On *June 7*, the remainder of the plantation was dusted, except 12 untreated plants in one corner. Some of the plants that were dusted on *June 2* were dusted a second time on *June 7*.

In order to compare the value of dusting with Derris powder to kill the beetle, with soft soap and Derris spraying to kill the maggots, fifty plants (including four of the previously untreated plants) were sprayed with :—

Soft soap	10 lb.
Derris	2 lb.
Water	100 gal.

The spraying was done by means of a power sprayer giving a pressure of about 180 lb. per sq. in., at the rate of 450 gal. per acre. In the plantation, the following treatments were employed for comparison :—

- (1) Untreated plants.
- (2) Plants sprayed on *June 20* and *29*.
- (3) Plants dusted on *June 7*.
- (4) Plants dusted on *June 2* and *7*.
- (5) Plants dusted on *June 2* and *7* and sprayed on *June 20* and *29*.

One hundred berries from each side of the plants were picked at random on the dates when the commercial pickings were made. The results are shown in Table VIII and Graph II.

TABLE VIII.—LOGANBERRIES : ST. IVES

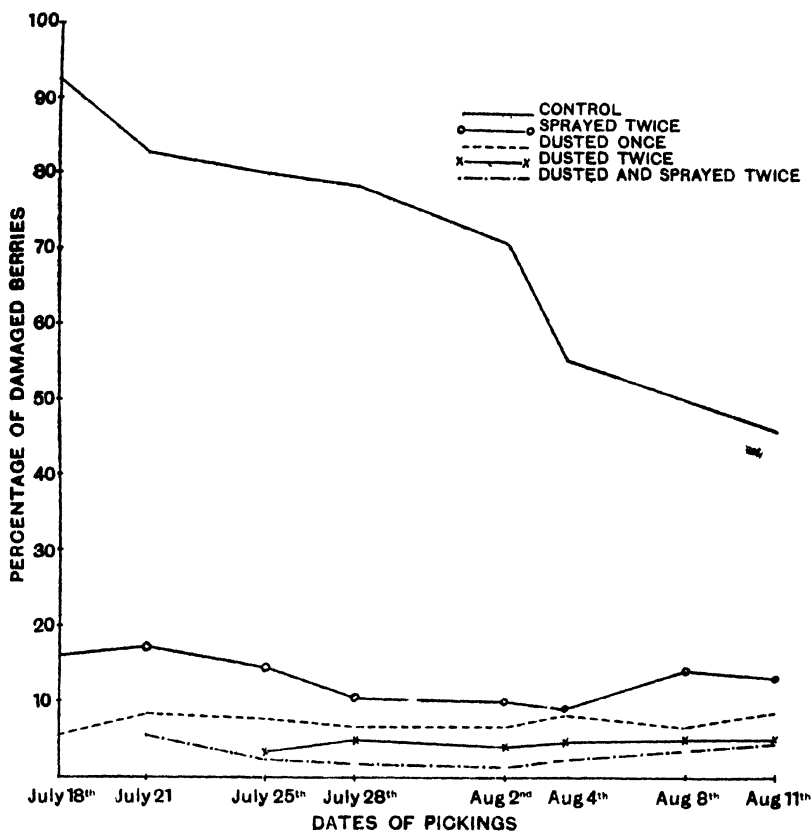
Dates of picking	Un-treated	Percentage of Damaged Berries			
		2 spray-ings	1 dust-ing	2 dust-ings	2 dust-ings 2 spray-ings
July 18	92.5	16.0	5.5	—	—
July 21	82.5	17.3	9.4	—	5.8
July 25	79.5	14.5	7.8	3.5	2.5
July 28	78.0	10.5	6.8	5.0	1.9
Aug. 2	70.4	10.0	6.8	4.0	1.3
Aug. 4	55.0	9.0	8.1	4.5	2.3
Aug. 8	49.5	14.0	6.5	5.0	3.8
Aug. 11	45.5	13.0	8.3	5.0	4.5
Average	69.1	13.0	7.4	4.5	3.2

The weight of the crop of marketable fruit from the untreated canes was very small compared with that from the dusted canes. The following comparison of the weight of

100 berries picked at random, on July 18, from two plots is instructive :—

100 berries from plants dusted twice weighed 380 grammes.

100 berries from untreated plants weighed 184 grammes.



GRAPH II.—Showing percentages of damaged loganberries from plots sprayed and dusted with derris.

At the time of dusting, the young fruits were covered with dust, but at the time of picking the dust was not sufficiently noticeable to affect their market value.

Conclusions.—The damage on the untreated plants gradually decreased as the season advanced ; this may be due in part to migration. One thorough dusting reduced the percentage of damage to 7.5 per cent. and two dustings reduced the damage still further to 4.5 per cent. Two sprayings reduced the damage to 13 per cent.

General Conclusions : Control on Loganberries.—From the above experiments it would appear that dusting with a Derris

dust (containing 0.2 per cent. of rotenone) is the most satisfactory means known at present of reducing the damage done to loganberries by the raspberry beetle.

The actual details as to the most economical methods and times of application have still to be worked out.

From observations made in plantations we suggest the following as a satisfactory method of attack: the first dusting should be made before the flowers open and when the beetles are feeding on the developing leaves of the new shoots. The operator should aim at coating the tips of these shoots with the dust. This requires very little dust and it may be advisable to make two applications in this way before the flowers open. When the flowers begin to open, the whole of the plants should be thoroughly dusted. This may require as much as 3 cwt. per acre or more.

The dusting should be done whenever possible in warm sunny weather. When the beetles are few in number, and feeding on the new shoots, it may be possible to keep them in check sufficiently with the early dustings.

The cost of this dusting will, of course, depend on the price of the dust and the amount used. For an early dusting, 1 cwt. of dust or less should be sufficient. Assuming that 1 cwt. of dust is used, the cost of the dusting will be about £2 per acre. For the late dusting, when the whole of the plant is dusted, about 3 cwt. of dust will be necessary. The cost of this late dusting will be about £6 per acre. With a vigorous plant of loganberries, more than 3 cwt. of dust per acre may be necessary.

These experiments also confirm those of Steer and show that a good control of the raspberry beetle on loganberries can be obtained by spraying with soft soap and Derris (0.2 per cent.) about 10 days after full bloom and again about 10 days later. (When hard water is used a spreader can be substituted for soft soap.) The control we obtained by spraying was not as good as that obtained by dusting with a Derris dust. Steer* has estimated the cost of two sprayings on raspberries at £7 15s. 0d. per acre. He suggests that for loganberries the cost would probably be in the neighbourhood of £6 per acre. One spraying with lead arsenate gave a 50 per cent. control, but it is dangerous to use this chemical on account of the deposit left on the fruit. As a result of these experiments we regard dusting as described above as the most satisfactory means of controlling this pest on loganberries.

* *Jour. of Pomology*, Vol. 10, Mar., 1932, p. 14.

Control of Raspberry Beetle on Raspberries.—No experiments were carried out with the dusting of raspberries, but observations were made on a plantation near Cambridge (with a moderately bad infestation) which was dusted with the above-mentioned Derris dust when the canes were in full bloom and after a number of eggs had been laid. Counts made on July 29 showed the number of damaged berries to be about 10 per cent. This suggests that this beetle can be satisfactorily controlled on raspberries by means of a Derris dust.

In the experiments, using sprays of soft soap and Derris (0.2 per cent.) ten days after full bloom, and again ten days later, a satisfactory control of this pest was obtained. Spraying with soft soap and nicotine sulphate (10 oz. to 40 gal. of water) at the same time gave equally satisfactory results. The cost of these two washes is approximately equal, but it should be borne in mind that nicotine sulphate is a standard article, whereas Derris powder is a product that varies in its composition.

The authors are very much indebted to Dr. F. Tattersfield, of the Rothamsted Experimental Station, for kindly determining the rotenone content of samples of the Derris preparations used in the above experiments, and to those growers in whose plantations the experiments were carried out.

* * * * *

INSTRUCTION IN CLEAN MILK PRODUCTION, 1932

THE prominence recently attached to questions relating to the organization, and to the hygienic quality of our milk supplies, gives a special interest to the efforts made by the agricultural education staffs of county councils to assist producers in improving the quality of their supplies. The county services have, on the whole, been well maintained, and the popular appreciation of their value steadily increases, although the over-riding necessity for economy in all public expenditure has caused some reduction of activity during 1932 as compared with the previous year. The following paragraphs give a summary of the principal work carried out during 1932.

Clean Milk Competitions.—These competitions, though organized on a competitive basis for the purpose of stimulating interest, are in reality a carefully designed form of instruction with a direct educational aim. Credits are allotted to competitors both on the result of actual inspections of their premises, equipment and methods, and also on the result of the bacteriological examination of samples of their milk. Interim reports on these examinations are issued periodically to all competitors during the progress of the competition, with comments and advice designed to assist in the detection and elimination of faults. Where necessary, special advisory visits are paid to the competitors' farms. It may be added that in the interim reports the competitors are designated by code numbers only, and a similar precaution is adopted in the final report on the competition as regards all competitors who do not succeed in obtaining prizes or certificates of merit.

There was a reduction in the number of clean milk competitions organized during 1932, owing to economics necessitated by the financial situation, but the loss of facilities for receiving instruction through these competitions was, to some extent, compensated by an increase in the number of non-competitive advisory schemes to which further reference is made below. The competitions were confined mainly to producers who had never before taken part in a competition or who, having competed previously, had failed to reach the standard of efficiency necessary to secure a certificate of merit. Producers who had already obtained certificates of merit, and licensed producers of "designated" milk, were not normally regarded as eligible for entry, but in a few

CLEAN MILK COMPETITIONS, 1930-32

County	Commenced 1930-31					Commenced 1931-32					No. of individual producers who have competed at least once	
	No. of com-petitors	No. of cows	No. of samples ex-aminated	No. of samples reached "desig-nated" stand-ards	Total advisory visits	No. of com-petitors	No. of new com-petitors	No. of cows	No. of samples ex-aminated	No. of samples which reached "desig-nated" stand-ards		Total advisory visits
Beds ..	21	500	123	92	30	11	4	228	66	49	15	25
Berks..	45	1,565	752	703	75	25	25	714	419	393	50	102
Bucks	54	1,041	693	479	410	55	17	1,075	440*	338*	320*	165
Cambs	27	451	241	137	50	17	17	283	81	51	100	67
Cheshire	..	—	—	—	—	—	—	—	—	—	—	99
Cornwall	24	333	216	195	120	—	—	—	—	—	—	76
Cumb and Westmorland	..	—	—	—	—	—	—	—	—	—	—	55
Derby	70	1,955	397	222	410	63	22	1,850	374	214	390	192
Devon	..	—	—	—	—	—	—	—	—	—	—	62
Dorset	..	—	—	—	—	—	—	—	—	—	—	53
Durham	..	—	—	—	—	—	—	—	—	—	—	57
Essex..	20	525	180	106	53	29	27	793	261	181	61	185
Gloucester	45	1,344	420	282	225	—	—	—	—	—	—	95
Hants	35	1,165	235	95	105	31†	16	1,248	186	81	93	213
Hertford	..	—	—	—	—	—	—	—	—	—	—	—
Herts	31	880	279	241	65	33	3	1,229	264	229	20	127
Hunts	33	762	196	84	128	—	—	—	—	—	—	42
Isle of Ely	11	198	63	44	39	—	—	—	—	—	—	15
Isle of Wight	23	384	138	89	107	—	—	—	—	—	—	23
Kent ..	34	780	456	330	108	—	—	—	—	—	—	134
Leices	38	1,156	342	305	64	24	24	598	230	186	52	62
Leics ..	..	—	—	—	—	—	—	—	—	—	—	79
Lincs (Holland)	..	—	—	—	—	—	—	—	—	—	—	—
" (Kestoven)	..	—	—	—	—	—	—	—	—	—	—	82
" (Lindsey)	9	112	63	40	40	—	—	—	—	—	—	59
Middlesex	17	616	153	122	100	6	5	129	54	29	60	47
Norfolk	44	1,440	264	152	176	25	23	519	150	110	80	89

instances (e.g., Bucks, Warwickshire and Yorkshire) such producers were admitted to a separate class in the clean milk competition in order to comply with the conditions of eligibility for the award of prizes contributed from private sources.

The summary on pp. 1030, 1031 gives full particulars of the clean milk competitions commenced during the financial years ended March 31, 1931, and March 31, 1932, respectively. (Most of these competitions commenced in January, 1931, and January, 1932, respectively, and extended into the following financial year.) In 1932, there were reductions of 13 in the number of competitions and 461 in the number of competitors, but the percentage of new competitors (60 per cent.) was very much greater. Included in the summary are details relating to the probationary section of the County Register of Accredited Milk Producers, which was conducted in Suffolk and Salop in 1931, and in Hampshire, Salop and Wiltshire in 1932.

The practical value of these competitions is indicated by the fact that 11 companies or societies concerned with the retail distribution of milk paid bonus on a gallonage basis or awarded cash prizes to such of their suppliers as performed satisfactorily in the competitions; and in several other cases contributions to the prize funds of the competitions were made by distributors.

Advisory Schemes.—Schemes involving the periodical examination of milk samples on behalf of producers who were not eligible to enter the county clean milk competitions were organized in Berkshire, Middlesex and Oxford. The total number of entries was 53 and, up to the date when the returns were made, 320 milk examinations had been carried out; 292 samples (91 per cent.) satisfied the bacteriological requirements for "designated" milk.

Notes on the progress of advisory schemes in other counties are given below :—

- (a) *Wiltshire*.—The advisory service for licensed producers of "designated" milk was continued during 1931, when 29 producers took part and 302 milk samples were examined. Returns relating to 1932 have not yet been received.
- (b) *Notts*.—An advisory scheme of 12 months' duration was commenced in January, 1932, in the Retford and Worksop district, 57 producers taking part. The number of milk samples examined during the period January to July was 363, of which 160 conformed with the bacteriological requirements for "designated" milk.
- (c) *Lincs (Kesteven)*.—Eight producers took advantage of the scheme during the year ended March 31, 1932; 14 milk examinations and 17 advisory visits to farms were carried out.

- (d) *Staffordshire*.—During the year ended March 31, 1932, the names of 338 farmers who were producing unsatisfactory milk were reported to the Agricultural Organizer by the County Medical Officer of Health and in 98 instances the Organizer's offer of advice was accepted. Advisory visits were paid to each farm and 23 milk examinations were carried out.
- (e) *Cheshire*.—The advisory service, which replaced the county clean milk competitions, was commenced in 1932; 47 advisory visits had been paid up to the date when the return was made, and 329 milk examinations had been carried out.

In Devon and Northamptonshire, advisory schemes have recently been organized with the co-operation of the County Health Departments, while in other counties the activities of the agricultural staff have been concentrated on securing reliable supplies in connexion with the "Milk in Schools" movement, which is spreading rapidly throughout the country.

It is interesting to record that, as a result of the advisory work carried out in Cornwall, three licences for the production of Grade A milk were taken out during the year ended March 31, 1932, and eight existing Grade A licences were replaced by Grade A (TT) licences.

County Register of Accredited Milk Producers.—Particulars of the schemes in operation during the year ended December 31, 1931, are given in the following summary. In 1932 the scheme was carried out in nine counties, but details of the results are not yet available. It is known that in at least three of these counties a system of bonus payments to producers has been introduced by distributors in connexion with the scheme.

<i>County</i>	<i>No. of Producers registered</i>	<i>No. of Milk Samples examined</i>	<i>Remarks</i>
Essex ..	22	234	{ Three producers removed from Register.
Hants ..	41	473	
Middlesex ..	5	39	Two producers suspended.
Salop ..	15	43	Scheme commenced October, 1931.
Suffolk ..	28	292	One producer suspended.
Warwicks ..	10	37	Scheme commenced September, 1931.
Wilts ..	28	279	Eleven producers suspended.
	149	1,397	

Milkers' Competitions.—There was no reduction in the number of competitions organized in 1932, but the number of competitors declined by about 350. Comparative figures for 1931 and 1932 are as follows:—

County	Year ended March 31, 1931			Year ended March 31, 1932		
	No. of competitions	No. of competitors	No. who reached proficiency standard	No. of competitions	No. of competitors	No. who reached proficiency standard
Bedfordshire ..	1	35	26	2	39	33
Berkshire ..	17	128	125	18	76	75
Bucks ..	2	20	15	3	43	40
Cambs ..	1	23	17	1	15	12
Cheshire ..	4	60	60	1	29	29
Cornwall ..	19	227	188	13	217	186
Essex ..	—	—	—	1	64	52
Hants ..	3	197	79	2	75	55
Herts ..	5	92	73	4	68	54
Hunts ..	1	50	23	—	—	—
Isle of Ely ..	1	11	10	—	—	—
Isle of Wight ..	—	—	—	11	70	52
Kent ..	1	61	47	—	—	—
Lancs ..	1	31	24	1	24	17
Leicester ..	5	35	30	3	21	14
Norfolk ..	1	105	70	1	85	69
Northants ..	1	28	17	—	—	—
Notts ..	—	—	—	1	14	11
Oxford ..	1	63	44	1	77	60
Salop ..	1	16	9	6	51	44
Suffolk ..	1	44	32	—	—	—
Surrey ..	1	71	57	2	68	56
Sussex, W. ..	2	26	26	2	27	27
Warwick ..	1	80	89	1	59	58
Wilts ..	4	58	58	3	34	34
Yorkshire ..	1	41	31	—	—	—
Flint ..	1	7	7	1	19	17
Merioneth ..	2	19	18	—	—	—
Monmouth ..	5	69	60	5	71	66
Pembroke ..	4	44	28	4	58	40
	87	1,650	1,263	87	1,304	1,101

Instruction provided by other Authorities.—Interest in the clean milk movement has been well maintained in the County Boroughs and other local administrative areas, and some authorities have been instrumental in arranging courses of instruction for producers and distributors.

A clean milk competition was organized in St. Helens, during the period February-July, 1932, in conjunction with the Lancashire County Competition, and details are included in the summary on pp. 1030, 1031.

The competition organized by the Grimsby Rural District Council with the assistance of the Agricultural Organizer for

Lindsey terminated on March 31, 1932, 20 producers having taken part. It is intended that a similar competition shall be held each year. The examination of samples of milk from all producers in the district revealed that 90 out of a total of 100 were producing satisfactory milk.

It is understood that the organization of clean milk competitions in Liverpool and Sheffield is under consideration, and in many other districts, too numerous to mention individually in this report, active steps are being taken by the local authorities to secure an improvement in the milk supply.

* * * * *

MARKETING NOTES

National Mark Beef.—The weekly average numbers of sides (including quarters and pieces expressed in terms of sides) of beef graded and marked with the National Mark during October, November and December, 1931 and 1932, and the three weeks ended January 21, 1933, were as follows :—

LONDON AREA—WEEKLY AVERAGES

<i>Period</i>		<i>London</i>	<i>Birkenhead</i>	<i>Scotland*</i>	<i>Total London supplies</i>
October	{ 1931..	1,788	282	1,133	3,203
	{ 1932..	1,568	1,176	982	3,726
November	{ 1931..	2,001	377	1,165	3,543
	{ 1932..	1,712	1,377	1,062	4,151
December	{ 1931..	2,277	423	1,421	4,121
	{ 1932..	1,810	1,163	1,200	4,173
Three weeks ended January 21, 1933		1,787	741	1,173	3,701

* Figures include Scotch sides graded and marked in London.

BIRMINGHAM AND YORKSHIRE AREAS—WEEKLY AVERAGES

<i>Period</i>		<i>Birmingham</i>	<i>Leeds</i>	<i>Bradford</i>	<i>Halifax</i>
October	{ 1931..	761	441	396	103
	{ 1932..	1,077	507	457	111
November	{ 1931..	843	500	478	122
	{ 1932..	1,213	541	417	106
December	{ 1931..	914	480	375	103
	{ 1932..	1,155	417	316	82
Three weeks ended January 21, 1933		1,168	515	393	82

Supplies of National Mark home-killed beef on the London Central Markets for the last three months of 1932 showed an appreciable increase over those for the corresponding period of 1931. With the exception of that for December, 1930 (11,464 sides), the figure for November (10,740 sides) was the highest monthly figure yet recorded.

The wholesale traders in the Birmingham City Meat Market have resumed their former practice of allowing beef to be

graded on their stalls *before* sale. For the first time since June, 1930, the operation of the scheme is now proceeding on normal lines, and the number of sides graded and marked has reached a very satisfactory level.

During November, the total number of sides of home-killed beef graded and marked in all areas was 23,006, which is the highest monthly aggregate since the scheme began.

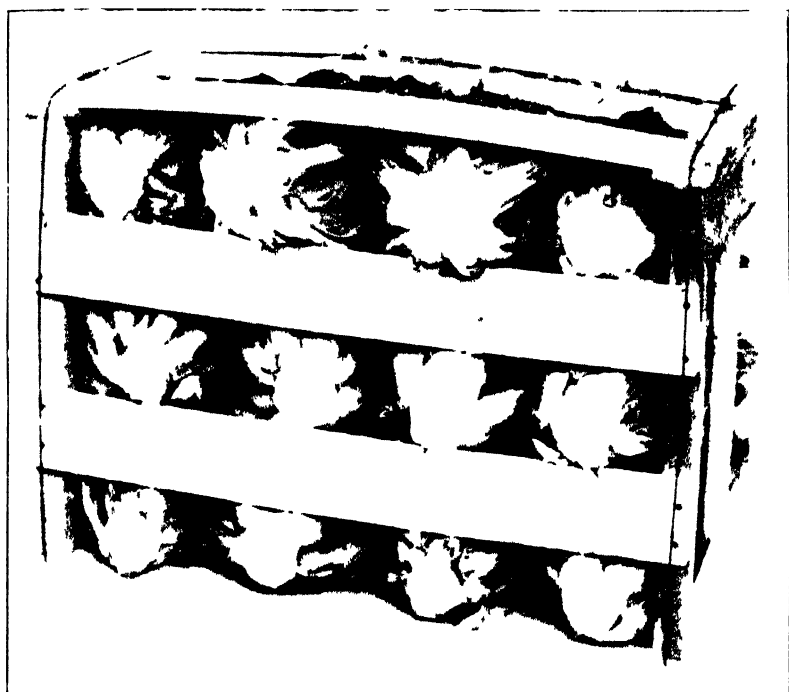
In the three months ended December 31, 1932, 57 consignments (473 cattle) were sent direct from farm to abattoir for sale by dead weight on the basis of National Mark statutory grades.

National Mark Scheme for Cauliflower and Broccoli.—

Cauliflower and broccoli together represent one of the most popular of our vegetables. In the appearance of the heads, as marketed, there is no clear differentiation between commercial samples. From the marketing standpoint, therefore, the Ministry has decided to defer to the request of representative growers and the distributors, and treat both vegetables as one, broccoli being regarded as winter cauliflower.

In 1931, imports of cauliflower and broccoli into the United Kingdom amounted to about 44,000 tons, worth at least £400,000. In addition, the value of imports of cauliflower in brine probably amounted to a further £100,000. It is generally true of all Continental supplies that they are fairly well standardized in regard to grading and packing, and buyers can be sure of the uniformity and attractiveness of the pack. The same degree of standardization does not exist as regards home supplies.

Although the home producer has now a protected market, the reasons for bringing the standard of home supplies up to that of imports are none the less urgent. It is expected of the home grower that he will replace by goods of equal quality the supplies that have been excluded by the imposition of duties. The opportunity is favourable for placing the home-grown product in an unassailable position as far as this can be done by attention to grading and packing, and, in areas where numerous small growers dispose of broccoli in distant markets, by the establishment of central grading and packing stations. Having regard to these considerations and to requests received from representatives of growers, the Ministry, in collaboration with the National Farmers' Union, has undertaken the preparation of a National Mark scheme for cauliflower and broccoli. Salesmen and distributors welcome the



Star-shaped seed pods in a wooden crate

addition of these vegetables to the range of National Mark standardized products.

Grade Designations and Definitions of Quality.—After consultation with the interests concerned, grade designations and definitions of quality as set out in Table I, p. 1038, have been agreed upon for home-produced cauliflower and broccoli.

These designations and definitions will be given statutory effect in the Agricultural Produce (Grading and Marking) (Cauliflower and Broccoli) Regulations, 1933, which refer only to cauliflower and broccoli produced in England and Wales.

PROCEDURE AND CONDITIONS TO BE OBSERVED BY PACKERS
AUTHORIZED TO APPLY THE MARK

No person may mark any article, covering or label with a statutory grade designation mark (i.e., the National Mark) unless authorized to do so by or under regulations made under the Acts.

(a) *Output.*—Authority to apply the Mark may be granted to :—

(i) Growers or packers with an estimated annual output of not less than 20 tons of cauliflower and/or broccoli or whose total area of land devoted to cauliflower and/or broccoli production in a year is not less than $2\frac{1}{2}$ acres.

(ii) Associations of growers. No output qualification will be prescribed for growers whose annual output is less than in (i) above and who form associations for the purpose of authorization. Particulars of the action to be taken by growers desirous of forming such associations may be had on application to the Ministry.

(b) *Grading.*—Authorized packers may apply the National Mark only to cauliflower and broccoli grown in England and Wales which, at the time of packing, comply with the definitions of quality prescribed for the grade designations "Selected" or "Selected Large" (see Table I).

(c) *Packing.*—The method of packing the contents of each package to which a National Mark label is applied must conform to the details specified in Table II, p. 1039.

In order to ensure that produce is carefully graded and packed so that it will arrive at its destination clean and in the best possible condition, growers are strongly urged to pack their produce under cover instead of in the open in the fields.

The wire strapping of all crates, whilst not compulsory under the scheme, is strongly recommended.

(d) *Use of National Mark Labels.*

(i) *General.*—Unless specially authorized to the contrary (see (iii) below), authorized packers may use only the serially-numbered official labels bearing the National Mark; these labels will be issued on payment, by or on behalf of the Ministry of Agriculture and Fisheries. Official National Mark labels may not be obtained from any other source. They are not transferable and care must be taken by packers to prevent the labels from getting into the hands of unauthorized persons.

The quality of the contents of each package to which a National Mark label is applied must conform to the statutory definitions set out in Table I, according to the grade designation appearing on the label.

TABLE I.—GRADE DESIGNATIONS AND STATUTORY DEFINITIONS FOR CAULIFLOWER AND BROCCOLI PRODUCED IN ENGLAND AND WALES

Grade designation	Definition of Quality					
	Curd				Stem	Wrapper leaves
	Size	Colour	Condition	Blemish (single heads)		
1	2	3	4	5	6	7
Selected	Each head shall measure not less than 4½" and not more than 5½" in diameter. The heads in any package shall be reasonably uniform in size	Each head shall be snow-white or creamy-white	Each head shall be compact; free from interposing bracts or leaves; not blown, woolly or over-mature	Each head shall be free from discoloration and from damage caused by foreign matter, disease, decay, frost, bruising, insects or otherwise	The stem shall be neatly removed immediately below the point of union with the basal leaves. The butt shall not be decayed	The wrapper leaves on each head shall be fresh and green and sufficient to afford protection to the curd, but in no case shall extend more than 5" from the surface of the curd
Selected Large (or, in the case of export, Prima Qualität; or Première Qualité)	Each head shall measure not less than 5½"* in diameter. The heads in any package shall be reasonably uniform in size					

* This size is *minimum* only. Larger cauliflower and broccoli may be packed as "Selected Large," if desired, provided they comply with the other requirements above.

Definitions

"Compact" means that the flower clusters are closely united in the curd, and the heads are solid to the touch.

"Damage" means any injury which would materially affect the appearance or edible quality of the head.

"Discoloration" means that the head is of abnormal colour.

"Blown" means that the flower clusters of the curd have started to elongate, causing the clusters to separate and give the curd an open appearance.

"Woolly" means that the surface of the curd has a velvety or hairy appearance.

"Over-mature" means a stage of growth which is beyond that of a compact, properly developed head.

TABLE II.—STANDARD METHODS OF PACKING TO BE EMPLOYED WHEN GRADE DESIGNATION MARKS ARE APPLIED TO CAULIFLOWER AND BROCCOLI

Grade designation	Non-returnable package	Method of packing	Declaration of contents
Selected	Rigid or collapsible wooden crates of approved types	Heads shall be firmly packed in double rows, butts facing outwards to the sides of the crate. Crates shall be lidded and fastened securely by nailing, wiring or tying	Contents of containers shall be declared by count. Crates shall contain 12, 16, 18 or 24 heads
Selected Large			

Note.—Growers are strongly urged in the interests of clean packing to pack their produce under cover instead of in the open in the fields.

The wire strapping of all crates is recommended.

NOTE.—Copies of a leaflet (Marketing Leaflet No. 35) giving full details of the National Mark scheme for cauliflower and broccoli may be obtained, post free, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

The National Mark label for both "Selected" and "Selected Large" grades will be blue in colour.

(ii) *Completion of Labels.*—When an official National Mark label is applied, it must bear conspicuously the actual count of contents. The count must be overprinted or stamped by the packer in the space provided for that purpose on the label. The label may also bear the name or brand of the packer and, if the packer so desires, the date of packing. Members of authorized associations of growers will obtain labels through their associations.

(iii) *Incorporation of the National Mark in Private Labels.*—As an alternative to applying the National Mark by means of the official labels, the Ministry may license an authorized packer or an association to incorporate the National Mark design in the design of private labels in a manner approved by the Ministry, for application to containers of National Mark cauliflower and broccoli. The conditions governing this arrangement may be ascertained from the Ministry on application.

(e) *General.*—An authorized packer must allow his packing operations and records of output and labels to be inspected at any reasonable time by any officer of the Ministry of Agriculture and Fisheries authorized in that behalf, and must allow such officer to open and inspect, on the premises either of the authorized packer or of his market-agent, any package packed by such authorized packer and bearing a National Mark label, and to remove or cancel the National Mark on any package, the contents of which, in the opinion of such officer, do not comply with the definition of the statutory grade designation appearing on the National Mark label or do not accord with the details thereon declared.

National Mark Scheme for Cabbage Lettuce.—Cabbage lettuce is one of the most widely-used salad vegetables in this country, but the home grower has had to compete in the past with heavy imports that have secured their hold on the market largely by virtue of standardized grading and packing. The home grower has laboured under the further disadvantage that there have been no generally accepted standards for the grading and packing of his produce.

After examination of the methods employed by exporters and by the leading home growers, the Ministry, in consultation with the National Farmers' Union, has, therefore, prepared a National Mark scheme, the standard grades and packs in which have been demonstrated at various agricultural shows throughout the country and have met with the general approval of producers and distributors.

The imports of lettuce into England and Wales have reached a total of about 10,000 tons annually, the greater part being cabbage lettuce. It is expected of the home grower that he will replace by goods of equal quality the supplies that have been excluded by the imposition of duties. The opportunity is a favourable one for increasing home production and for placing the home-grown product in an unassailable position as far as this can be done by attention to grading and packing. The publicity that has been accorded to the National Mark movement and the goodwill that has thus been built up for National Mark produce will now be at the disposal of growers of cabbage lettuce.

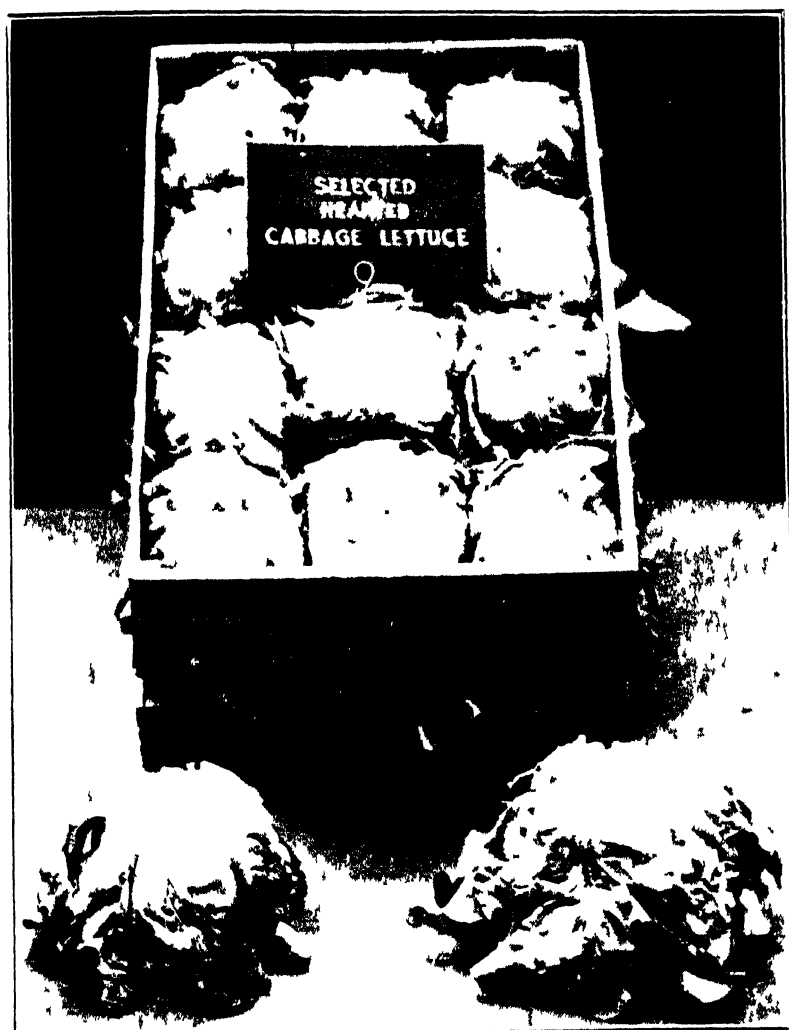
Grade Designations and Definitions of Quality.—After consultation with the interests concerned, grade designations and definitions of quality, as set out in Table I, p. 1041, have been agreed upon for home-produced cabbage lettuce, and will be given statutory effect in the Agricultural Produce (Grading and Marking) (Cabbage Lettuce) Regulations, 1933, which refer only to cabbage lettuce produced in England and Wales.

PROCEDURE AND CONDITIONS TO BE OBSERVED BY PACKERS
AUTHORIZED TO APPLY THE NATIONAL MARK

No person may mark any article, covering or label with a statutory grade designation mark (i.e., the National Mark) unless authorized to do so by or under regulations made under the Acts.

(a) *Output.*—Authority to apply the Mark may be granted to :—

- (i) Growers or packers of outdoor-grown cabbage lettuce with an estimated annual output of not less than 4,000 standard crates or whose total area of land devoted to cabbage lettuce culture in a year is not less than two acres and to growers or packers of glasshouse-grown cabbage lettuce with an estimated annual output of not less than 500 standard crates.



SELECTED HEADED CABBAGE LETTUCE

Grade designation 1	Size 2	Colour 3	Condition 4	Blemish 5
Selected Hearted	Each lettuce shall measure not less than 3½ in. in diameter when encompassed by hand and reasonably compressed; the lettuce in any one package shall be reasonably uniform in size and shall not vary in diameter by more than 1 in.	Each lettuce shall be green and substantially free from discoloration. One variety only shall be packed in any one package	Each lettuce shall be clean, tender, fresh, crisp, compact (the inner leaves shall be closely enfolded and have formed a heart) and the head shall not be split. Each lettuce shall be free from doubles (i.e., two heads on one stem) and shall show no visible signs of seed stems. The root system shall be removed and the stem shall not protrude more than ¼ in. below the basal leaves	The wrapper leaves shall be free from appreciable injury and each lettuce shall be free from damage caused by decay, bruising, disease or insects
*Selected Hearted Glasshouse	Each lettuce shall measure not less than 3 in. in diameter when encompassed by hand and reasonably compressed; the lettuce in any one package shall be reasonably uniform in size and shall not vary in diameter by more than 1 in.	Each lettuce shall be green and substantially free from discoloration. One variety only shall be packed in any one package	Each lettuce shall be clean, tender, fresh, crisp, free from doubles (i.e., two heads on one stem) and shall show no visible signs of seed stems. The root system shall be removed and the stem shall not protrude more than ¼ in. below the basal leaves	The wrapper leaves shall be free from appreciable injury and each lettuce shall be free from damage caused by decay, bruising, disease or insects
*Standard Glasshouse	Each lettuce shall weigh not less than 2 oz. and the lettuce in any one package shall be reasonably uniform and shall not vary in weight by more than 2 oz.	Each lettuce shall be green and substantially free from discoloration. One variety only shall be packed in any one package	Each lettuce shall be clean, tender, fresh, crisp, free from doubles (i.e., two heads on one stem) and shall show no visible signs of seed stems. The root system shall be removed and the stem shall not protrude more than ¼ in. below the basal leaves	The wrapper leaves shall be free from appreciable injury and each lettuce shall be free from damage caused by decay, bruising, disease or insects

* Glasshouse lettuce shall be grown *entirely* under glass (glasshouse, cold frame or cloche).

TABLE II.—STANDARD METHODS OF PACKING TO BE EMPLOYED WHEN GRADE DESIGNATION MARKS ARE APPLIED TO CABBAGE LETTUCE

Grade description	Package	Lining paper and method of packing	Declaration of contents
Selected Hearted	<p>Non-returnable of approved type</p> <p>In the case of Standard Glasshouse lettuce the packages must have lids. The use of lids is optional for Selected Hearted or Selected Glasshouse lettuce</p>	The crate shall be full and the lettuce shall be firmly packed in two layers, either head to head, with stalks facing the top and bottom of the crate, or head down	The actual count shall be declared. In practice, the count will be in units of 6 and the normal count would be 18, 24 or 30
Selected Hearted Glasshouse		The package shall contain two layers of lettuce packed firmly, either head to head, with stalks facing the top and bottom of the package, or head down. The crate shall be full. When lidded, the package shall be lined with white grease-proof paper and a sheet of white grease-proof paper shall be placed between the two layers of lettuce	The actual count shall be declared. In practice, the count will be in units of 6 and the normal count would be 18, 24, 30 or 36
Standard Glasshouse		The package shall be lined with white grease-proof paper. The lettuce shall be packed in orderly layers, separated by a sheet of grease-proof paper. The crate shall be full	The actual count shall be declared. In practice, the count will be in units of 6 and the normal count would be 36 or 42. In the period December 1 to March 31, the maximum count may be 48

NOTE.—Copies of a leaflet (Marketing Leaflet No. 34) giving full details of the National Mark scheme for Cabbage Lettuce may be obtained, post free, on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

(ii) *Associations of growers.* No output qualification will be prescribed for growers whose annual output is less than prescribed in (i) above and who form associations for the purpose of authorization. Particulars of the action to be taken by growers desirous of forming such associations may be had on application to the Ministry.

(b) *Grading.*—Authorized packers may apply the National Mark only to cabbage lettuce grown in England and Wales which, at the time of packing, comply with the definitions of quality prescribed for the statutory grade designations "Selected Hearted," "Selected Hearted Glasshouse" or "Standard Glasshouse" (see Table I).

(c) *Packing.*—The method of packing the contents of each package to which a National Mark label is applied must conform to the details specified in Table II, p. 1042.

(d) *Use of National Mark Labels, etc.*—Authorized packers will also be expected to conform to certain rules regarding the use and completion of National Mark labels and other matters as required of packers authorized in the National Mark scheme for cauliflower and broccoli, which is also described in this issue.

Publicity for National Mark Products.—Retail butchers in Leeds were precluded from entering for the shop window-display competition held during the Leeds National Mark Shopping Week in July, 1932, owing to the need for keeping meat in cool quarters during the hot weather. In accordance with a promise made to the butchers on that occasion, a National Mark beef window-display competition, for which the Ministry offered three prizes of £10, £6 and £3, respectively, was held in Leeds on January 26. A good entry was received and the competition aroused considerable interest, not only in the trade but among the general public. The judges were Mr. G. H. Collinge, of Southport, and Mr. W. Wright, of York, both prominent meat traders, with Mr. G. W. Skinner, of Nottingham, a display expert nominated by the National Display Association.

Points were awarded on the following basis :—

Selling capacity and general "first glance" effect including design (i.e., power to arrest attention) ..	20 points
Technical skill in cutting and attractive presentation of joints	20 points
Originality of design and arrangement	20 points
Bringing out the message of the National Mark ..	20 points
Neatness in displaying price tickets	10 points
General neatness of workmanship	10 points
	<hr/> 100 points

Following the National Mark Shopping Week held in Leeds last July, a considerable amount of free publicity has been given to the National Mark in the City. Several cinema theatres have displayed the Ministry's films; more recently, no fewer than 79 garages have displayed some of the large

National Mark posters that have appeared from time to time on the Empire Marketing Board's advertising frames; and 20 garages in Bradford have also taken these posters.

One of the main objects of the National Mark movement is to make it possible for home produce to be dealt with freely in the large wholesale markets on the basis of statutory grades. It is undoubtedly achieving much in this direction. Large trading bodies and public and semi-public institutions find that they can purchase National Mark commodities with confidence, and instances are constantly coming to notice indicating the increasing extent to which the National Mark is being used in large transactions. For example, a number of hospitals and other institutions in the Birmingham district now specify National Mark beef in their contracts. The London County Council buys large quantities of National Mark *Medium* eggs, whereas formerly it was not possible to buy more than a very few English eggs. National Mark flour, National Mark canned fruits and National Mark malt extract with cod-liver oil figure in the contract forms of other local authorities.

Cookery demonstrations illustrating the baking qualities of National Mark flour have been held with the co-operation of gas and electricity supply authorities as follows: Great Yarmouth, January 12-20; Kettering, January 16-21; and Colchester, January 16-27. In each case, the demonstrations were supplemented by displays of National Mark flour put up by local millers and packers.

Displays of Home Produce.—The Ministry will be represented at the British Industries Fair, Olympia (Feb. 20-March 2) with a stand in the Empire Marketing Board Section, when a representative display of the produce of England and Wales will be staged.

Wheat Act, 1932.—On December 31, 1932, registered growers of wheat throughout the United Kingdom received cheques from the Wheat Commission representing payments in advance on account of deficiency payments due to them in respect of sales of wheat covered by certificates sent to the Commission before the end of November. The advance was at the rate of 3s. per cwt., and the total amount distributed was about £1,250,000. The Commission hope to make, in due course, an interim payment in respect of certificates lodged with them between December, 1932, and March, 1933.

Certificates received by the Wheat Commission from registered growers up to January 13, covered 10,372,376 cwt. of millable wheat, sold at an average price per cwt. (at farm) of 5s. 5d. The total sales of millable wheat of the 1932 crop up to July 31 next have been estimated, for the purpose of the Wheat Act, 1932, at 19,800,000 cwt.

Production of Home-Grown Beet Sugar.—By December 31, 1932, the production of home-grown beet sugar at the 17 factories operating during the current season had already passed the total production during the manufacturing season of 1931-2, when 18 factories were operating. The amounts of beet sugar manufactured in December, 1932, and in the corresponding month in 1931, were :—

			cwt.
December, 1932	..	..	2,153,825
December, 1931	..	..	1,394,055

The aggregate output of sugar during the two beet-sugar manufacturing campaigns to the end of December was :—

			cwt.
1932	..	..	6,067,026
1931	..	..	4,927,778

Sugar-Beet 1932-3 Crop Data.—The following averages have been compiled from data relating to beets delivered to the 16 beet-sugar factories operating in England and Wales during the five weeks ended January 14, 1933. (Averages for the corresponding weeks in the previous season (17 factories) are shown for comparison) :—

Week ended	Average weight of roots (grammes)		Average sugar- content (per cent.)		Average weight of sugar per root (grammes)	
	1932-3	1931-2	1932-3	1931-2	1932-3	1931-2
December 17	469	376	17.1	16.6	80	62
„ 24	483	362	17.1	16.5	83	60
„ 31	488	352	17.1	16.5	83	58
January 7	505	345	17.0	16.0	87	55
„ 14	568	—	17.5	—	99	—
Averages for season	476	392	16.9	17.3	80	68

United States of America : The Domestic Allotment Plan. —

The American farmer produces large quantities of wheat, cotton, tobacco and other agricultural products for export, and the prices he receives for his entire output—both for home consumption and export—are broadly determined by the prices obtaining on the world markets. In the circumstances, he has, in general, been unable to share to the full in the benefits of the American system of Customs duties and, since the War, there has been a continuous disparity

between agricultural prices and the prices of other commodities in the United States.

Many attempts have been made to find a remedy for this state of affairs. In 1929, the Agricultural Marketing Act was passed by Congress. The purpose of this Act, which is administered by the Federal Farm Board, is to control production by educational efforts, to encourage co-operation in marketing and, in cases of emergency, to stabilize prices by purchasing surplus stocks with Government funds. The operations of the Board were, however, unable to cope with the effects of the precipitous decline in international price levels. Farmers continued to produce in excess of consumption and the situation steadily grew worse. A typical example is that of wheat where, in spite of the heavy fall in prices, production increased from 812,573,000 bushels in 1929-30 to 858,160,000 bushels in 1930-31 and to 894,204,000 bushels in 1931-32.

Among the proposals put forward to deal with the situation is the "Voluntary Domestic Allotment Plan of Farm Relief," which has been embodied in a Bill—now before the House of Representatives*—to amend the Agricultural Marketing Act. This Bill, as at present drafted, has the dual purpose of making the tariff effective on that part of the production of certain farm products which is domestically consumed and of enabling farmers to adjust their production to demand.

The Domestic Allotment Plan aims at making the tariff effective by a procedure similar in principle to that of the Wheat Act of the United Kingdom, namely, the payment of a subsidy to producers from the proceeds of a levy on the manufactured (or processed) article. Wheat, cotton, rice, tobacco and pigs have been mentioned as coming within its scope. In the Bill, it is provided that the plan shall be brought into effect only for those commodities which, by reason of production exceeding domestic demand or otherwise unduly depressing prices, are selling below their pre-war purchasing power and only when at least 60 per cent. of the producers of the commodity—by numbers or production—have, by vote, indicated their willingness to co-operate in carrying out its provisions. Even when the plan is brought into effect, there is still no compulsion on the individual farmer to adopt it. If he chooses to remain outside the scheme, he may retain his liberty of action in production, but he will receive no bounty and will obtain for his products only the selling price dictated by the world price-level.

* It is understood that the original measure has been replaced by a later Bill on somewhat different lines. The second Bill was passed by the House of Representatives in January, 1933.

The levy, or tariff adjustment charge, as it is termed in the Bill, must not exceed the tariff payable on the importation of the commodity (or 5 cents. per lb. on cotton), nor must it be established at a level that would increase the wholesale cost of the article above its purchasing power in the period 1910-14, as indicated by the Bureau of Labour index numbers. The charge, which is to be imposed by the Federal Farm Board, is to be paid by the manufacturer, processor or distributor, as the Board may direct. Animal feeding-stuffs and any commodity processed or manufactured by producers for use in their own households or by their live stock are exempt from the charge, and drawback or exemption will be allowed on exported goods.

The funds thus obtained will be used to pay each producer who adopts the plan a "tariff benefit" on his allotment of the domestic consumption of the commodity, which is to be based on his average production for the preceding five years. In the Bill, the adoption of the plan involves each producer in the making of a contract with the Board to adjust his production. More specifically, the contract requires that the producer will not increase his acreage or, in the case of live stock, the number bred or carried or the quantity sold, and that, at the request of the Board, he will reduce his acreage (or live stock) by such proportion as the Board may specify, not exceeding 10 per cent. of his allotment. It will not, however, be a violation of the contract for a farmer to increase his acreage if he arranges with another farmer to reduce his acreage by an equal amount below the amount specified in his contract. The contract may also contain a clause empowering the Board to direct the use to which land withheld from the production of the crop in question may be put. A farmer may lodge his contract with a bank or credit corporation as security for a loan up to 90 per cent. of his estimated bonus. The contract is made for one year, at the end of which the farmer is free to decide whether he will renew it or not.

The administration of the plan will be decentralized as much as possible. The Board will act through State allotment committees, the members of which are to receive remuneration, and through county and local allotment committees (unpaid).

It is claimed for the plan that it will make the tariff effective on the domestic consumption of products of which there is an exportable surplus, and farmers' incomes will, therefore, be increased. The plan is, however, entirely self-

supporting and requires no funds from the Public Treasury. At the same time, it provides machinery for the control of production. In this connexion, it should be noted that, while the Federal Farm Board is the executive authority, it rests with producers to determine each year by vote whether acreage or production shall be reduced and, if so, by how much. Moreover, if it appears that the operation of the plan is likely to force increased quantities into export, the Board is authorized to conduct a minor stabilization operation to take the surplus off the market and divert it to some lower use or hold it for subsequent sale. The interests of the consumer are protected by the provision that the tariff adjustment charge must not be such as to raise the price of the commodity above its pre-war purchasing power. Finally, there is no interference with existing marketing agencies.

It remains to be seen, if the scheme is passed into law by Congress, how far the farmers will give it their support. The plan is democratic and certainly novel in one respect: a secure cash benefit usually leads to an expansion of production, but, in this case, the cash benefit is linked to a system by which production is regulated.

Italy: A "National Mark" for Tomatoes.—The Italian Regulations (1932) for the extension of the Italian National Mark system to tomatoes intended for export require that export tomatoes shall be of one of the following types: "smooth round," "round ribbed" or "ribbed," and that the contents of each package shall be of one type only. The tomatoes must be graded into specified size-categories, namely, A, B, C and CC for "smooth round" and "round ribbed" fruit ranging from 12-21 cm. in circumference, and AC and BC for "ribbed" tomatoes of from 14-25 cm. in circumference. Provision is made for the use of various standard types of wooden crates of specified dimensions; in certain packages, the tomatoes must be packed in arranged layers, the "diagonal" system of packing being recommended. Standard methods of labelling are also defined.

The examination of consignments is carried out by inspectors of the National Institute of Exports at the railway station or port at the time of loading, and a satisfactory certificate must be attached to the way-bill before the tomatoes can be dispatched.

SEED CERTIFICATION SCHEMES

SINCE the war, two factors, in the main, have been influencing the character of supplies of agricultural seeds. On the scientific side, earlier trials had pointed to the value of "strain"; and post-war workers have given a good deal of attention to this factor and to its significance in modern husbandry. The passing of the Seeds Act in 1920 has, on the administrative side, assisted to improve very considerably the quality of most of the seed supplied to farmers. The principal concern of the Act has, however, been quality expressed in terms of purity and germination, though it is true that with certain classes of seed the Act requires, in addition, a declaration of the country of origin and of the distinctive name of the variety. The fear is sometimes expressed that too much emphasis may be placed on purity and germination, leading to a demand merely for bold and bright seed; and that there may be a tendency to overlook the information afforded by the declaration of origin and variety. English strains of red clover, for example, must often be harvested under climatic conditions that make it impossible for them to present the evenness in size and colour that is to be found in many imported parcels; but the merit of these home-grown supplies rests in their performance under field conditions rather than on the percentage of germination that can be obtained in the laboratory.

Without detracting in the least from the importance of high purity and germination, it is well to remember that the percentage of germination, more especially, is of assistance only in comparing like with like; and, though purity is a more complex matter, if the difference between seed of high purity and seed of low purity is made up of broken seed, inert matter and "other useful seeds," the situation is much the same. Purity and germination figures are of great importance in comparing, say, two offers of Essex broad red clover; but they are quite a secondary consideration in comparing Essex broad red with Italian seed.

The buyer is certainly afforded a measure of guidance both by the terms in common usage in the seed trade—"broad red," "late-flowering red," and so on—and by the statement as to country of origin. These go a good way towards telling the farmer what characteristics he may expect to find in the seed he purchases; but the need for some further dependable form of guarantee is undoubtedly making itself felt. On the one hand, the pressure of economic circumstances is forcing the farmer to seek to make the utmost of his own individual

holding; on the other, there is no known laboratory test that will distinguish between strains of greater and of less persistence. The proof of the pudding must be in the eating.

The distinctive value of certain kinds of seed grown in certain definite areas has, of course, long been recognized. The most familiar example is probably that of Kentish wild white clover, which has enjoyed its own peculiar reputation for at least a century. There are, however, several other instances in which a local, if not a national, reputation has been acquired as a result of practical experience. A strain of some variety of grass or clover has been built up, consciously or otherwise, and has been found to possess special characteristics that make it valuable for certain purposes. The problem is how best to encourage the production of these strains; how to bring them to the notice of those to whom they should appeal; and how to ensure that the buyer gets the one he wants.

This article presents, in very brief form, the principal features of some co-ordinated efforts that have already been made in this direction; but it will not, of course, trespass into the domain of the plant breeder, whose aim it is to produce *better* breeds rather than to encourage and augment the production of existing ones. The following notes leave out of account, also, the Ministry's schemes for the inspection and certification of growing crops of potatoes, strawberry plants and black-currant bushes, all of which are much akin to seed certification schemes, in that they also relate to the "raw material" of production. Particulars of the strawberry and black-currant schemes appear, however, in this JOURNAL for May, 1932 (p. 147), and the potato scheme is explained in the issue for November, 1932 (p. 741).

Wild White Clover.—The first, and so far the only, scheme of a national character relating to grass or clover seeds is that in respect of wild white clover seed, brought into operation within the last two or three years by the National Farmers' Union and the Ministry, acting jointly. The negotiations that led up to its adoption were rather long drawn out; and in the interval between the original suggestion of the scheme and its inception, two other attempts at the certification of wild white clover seed had been made. One of these, a private effort on the part of a prominent firm in Kent, remains in existence notwithstanding the national scheme. Its operation is confined to pastures in Kent that

are 10 years old or more. These old pastures are inspected and recorded by the firm, and seed crops taken from them are purchased and sold as Kentish old pasture seed.

A year or two before the national scheme came into being, an association of growers of wild white clover seed in Wiltshire was formed, and arrangements were made for crops to be inspected by an officer of the Welsh Plant Breeding Station at Aberystwyth. No age limit was laid down, and the check upon the seed consisted solely in the field inspection made by this officer.

The scheme prepared by the National Farmers' Union and the Ministry, which is open to all growers in England and Wales, goes considerably farther than either of the two mentioned above. Its object is two-fold, namely, to assist the grower of suitable seed to obtain a market and a fair price for his produce, and at the same time to afford a measure of guarantee to the buyer that he is getting the article he requires. Two types of pasture are eligible for recording : (a) old pastures (that is to say, fields that have been under grass for 10 years or more), and (b) fields that are " once-grown " from seed saved from these old pastures.

Three separate checks are imposed under the scheme. In the first place, applicants are required to complete a form giving details of the age and history of each field, and County Committees are charged with the duty of verifying that the fields submitted are either " old pastures " or fields sown with " old pasture " seed. Fields that qualify under one or other of these heads are examined by inspectors of the Ministry, who satisfy themselves that the white clover plants are of the " wild " type. A little later in the season samples of clover heads are taken from each of the fields, the seed is rubbed out and small plots are sown for a " growing-on " test. These plots are examined by an Inspection Committee set up for the purpose, comprising representatives of growers on the one hand and the seed trade on the other, together with technical officers of the Ministry and of the Department of Agriculture for Scotland. It follows, of course, from the fact that this " growing-on " test is prescribed that a period of at least a year must elapse between the date of application and the date of " recording " any field submitted. When once a field is recorded, however, as capable of producing certified seed, it is open to the farmer to take a crop whenever he likes, and to apply for a certificate in respect of it. The intention is that the single field inspection which takes place

before a field is recorded should remain good at least for a period of years, though it is understood that arrangements will be made for occasional inspections of a proportion of the recorded fields in succeeding seasons. The only fee that is payable by applicants is that charged for the field inspection—at the moment 2s. per acre for the first 10 acres, and 1s. per acre for each acre or part of an acre in excess of 10.

The wet weather experienced during the summers of 1930 and 1931—the first two years of the scheme—naturally proved a severe handicap. The luxuriant growth of grasses made it difficult to inspect fields satisfactorily, and in many cases impossible to collect clover heads suitable for a “growing-on” test. In spite of these difficulties, some 7,000 acres have already been recorded as eligible to produce certified seed. Seed crops have been few and small, however, for the last two years, and there have not yet been many applications for certificates.

Montgomery Late-Flowering Red Clover.—During 1922 and the early part of 1923, several meetings were held at suitable centres in Wales to discuss the possibilities of organizing the production of certain local strains of red clover seed. The best^{known} of these is the Montgomery late-flowering red clover, a strain that has enjoyed for many years a reputation for persistence which makes it much sought after for use in mixtures intended for three-year leys. The most important outcome of this series of meetings was the decision to set up an association of growers of this Montgomery strain. The first essential of organization was, of course, to ensure that the whole of the seed sold under the ægis of the Association should be characteristic of the strain that had already made itself a name and a market; and this necessitated a system of annual field inspection. The Association was able to enlist the assistance of the Welsh Plant Breeding Station, and to arrange for one of the officers of the Station to undertake the field examinations.

Since its early years, the Association has strengthened and improved its position very considerably. In 1929 it decided to raise capital for purchasing and erecting seed-cleaning machinery, and also to assist its members in marketing their seed; and for this purpose it became registered as a Co-operative Society under the Industrial and Provident Societies Act, 1893. It now possesses its own seed-cleaning depot and dispatches all consignments direct from this depot in bags

bearing its own seal. The quantity of uncleaned seed dealt with varies between about 25 and 40 tons per annum. Up to and including 1931, the annual inspection continued to be conducted by an officer of the Welsh Plant Breeding Station, but it is understood that other arrangements have been under consideration.

Upon the Inspecting Officer's recommendation, certificates are issued by the Society for those crops that are of the true strain of Montgomery late-flowering red. As crops are threshed, they are delivered to the Society's depot for cleaning, and samples of the cleaned seed are sent to the Official Seed Testing Station for examination and report. The seed is graded according to purity and germination. Growers are at liberty to effect their own sales at the prices fixed for the different grades, but the seed itself and the invoices are sent out by the Society, which collects the accounts.

Membership of the Society is open to growers of this particular strain of red clover either in the county itself or in certain neighbouring parishes in Salop. Farmers occupying less than 100 acres are required to take up three £1 shares in the Society, while those having larger holdings must take up five shares. There are still some growers outside the Society, and, since there is nothing to prevent these from selling their seed under the name "Montgomery late-flowering red clover," the Society have had under consideration the question of registering a suitable trade mark for the use of its members.

Vale of Clwyd Red Clover.—About the time when the Montgomeryshire Association was first constituted, efforts of a similar kind were made in the Vale of Clwyd. The red clover originally grown in this area of North Wales was also a strain of late-flowering red. Owing, however, to the introduction of broad red varieties during the war, some mixture had taken place; and one object in endeavouring to form an association was to retrieve the reputation that had previously been held by the local seed. Arrangements were made for the inspection of fields by the Botanical Department of University College, Bangor.

Some little progress was made by the Association during the first few years, but it was not continued, probably owing mainly to the small number of growers, the lack of suitable cleaning facilities, and the consequent difficulty of organization. Another factor that may have helped to complicate matters was that two obviously different strains seemed to be worthy

of certification. One was the original late and very persistent strain, and the other an intermediate strain that had since developed which, while possessing a more robust character, was rather earlier in flowering and somewhat less persistent.

During the last year or so, an attempt at reviving the Association has been made. Whether it will ultimately "find its feet," as the sister body in Montgomeryshire appears already to have done, remains to be seen; but if it does, it seems probable that it will concentrate on the intermediate-flowering (Llanrhaiadr) strain that now predominates in the Vale.

Cornish Marl Red Clover.—Shortly after the initial steps had been taken to set up the two Associations of red clover seed producers in Wales, a similar move was made in Cornwall among growers of Cornish marl clover. This strain of late-flowering red clover, having characteristics very similar to those of Montgomery red, appears to be indigenous to that part of Cornwall lying between St. Columb and Wadebridge. The Association was actually formed in 1924, and arrangements were made for inspection of fields by officers of the County Agricultural staff and of Seale Hayne Agricultural College. A form of certificate was approved for issue by the Association on the sale of seed from certified stocks. In 1927 the Association began to handle the produce of its members, and adopted a sliding scale of prices varying according to the percentages of purity and germination; but the experiment was not successful, and it was decided to revert to the original practice under which the Association certified crops but left individual members to dispose of their seed.

In 1928, and again in 1929, the area examined reached some 225 acres, of which about 150 acres (representing, say, 15-20 tons of seed) were approved for certification in each of those years. The figures have fallen off since, owing to the extremely bad harvesting conditions of the two succeeding years, but 1932 has afforded indications of a recovery.

Membership of the Association is open to individuals or firms interested in growing, cleaning or distributing Cornish marl clover seed, on payment of an annual subscription of 5s.; and the travelling expenses incurred at the time of inspection are met by charging a fee of 6d. per acre.

North Lindsey Seed Growers.—A somewhat different line of action from that of the bodies mentioned above has been

taken by the North Lindsey (Lincolnshire) Seed Growers' Association, which was formed at the beginning of 1930. It is generally known that the bulk of English red clover seed, both broad and late-flowering, is grown in the eastern half of the country, chiefly between the Wash and the Thames; but as seed production has been organized there on a commercial basis for many years, and is largely undertaken on behalf of the well-known firms of seedsmen, local strains have tended to lose their identity. The object of this Association was not to foster a particular local strain already established and recognized, but to pick up on a strain of seed suited to the conditions of the district and to maintain it unimpaired, or even to improve it by processes of natural selection.

The Association set out to provide its own members in the first place, and the trade also in the fulness of time, with pedigree seed of local production that could replace those supplies, described as English, that appear to have acquired nationality by having been once- or twice-grown from imported seed. They began their activities by obtaining and distributing among their members a stock of broad red clover that had been recommended to them as having been grown on the same English farm for 40 years. In spite of the disastrous conditions for clover seed production experienced in 1931—the first year in which it was intended to take a crop—a small quantity of seed was saved, though it was, naturally, in rather poor condition and insufficient in amount to do more than supply the individual grower's own needs; but the members have not given up hope of success.

Membership of the Association is limited for the present, and an annual subscription of 10s. is charged. Inspection of crops has been carried out by a small committee consisting of the Agricultural Organizer, an officer of the Midland Agricultural College, and one other member.

Norfolk Seeds Association.—Another new departure was more recently made in Norfolk, where an Association was formed early in 1932 to experiment with the production of certified seed barley grown from stock seed from the Norfolk Agricultural Station at Sprowston. The scheme will no doubt be modified or amended according to experience, but the general idea is to distribute Sprowston seed, of varieties proved in the station trials, among farmer members of the Association, who are all connected with the Agricultural Station, and to market the produce through selected merchants, who are also members

of the Association and the Station. A system of certification has been drafted, and the costs of cleaning and marketing are to be met by deductions from fixed selling prices. It is not intended that the scheme shall embrace seed more than once grown from Sprowston.

Generally.—Some of these attempts at organization are admittedly in their early stages ; and it is, perhaps, too soon to say that any of them, save the Ministry's potato scheme, has stood the test of time. It is, however, a sign of the times—and food for reflection—that farmers and their advisers in so many widely-separated parts of the country are turning their minds into similar channels. In each instance, the two-fold object may be discerned. First, is the desire to secure to the producer of valuable strains of seeds the differential price that he is entitled to expect for better and more adaptable seed ; and, secondly, to guarantee to the buyer and user that he will get an article well suited to his purpose. The margin between the best and the worst is more than ample to afford substantial gain to both.

Not every district, nor every county, has its own special strain that will pay for preservation ; but there must be a number of others where the formation of a growers' association is worthy of consideration. The situation is not helped by the fact that, in the nature of the case, organizations must generally be of a local and a voluntary nature, for local voluntary organizations are not easy either to create or to maintain. There may be some encouragement in the thought that the Government's policy of restricting imports, coupled with the increasing interest in seed improvement, seems to offer unusual opportunities to producers of good and guaranteed strains of seed.

FEBRUARY ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,

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Cereal Crops.—There is still time to decide whether or not to sow more wheat. Spring-sown wheat is less reliable than autumn-sown wheat, and although certain varieties are specially suited for spring sowing, the yield is usually below the average for autumn-sown crops. As compared with autumn-sown crops, wheat sown from now onwards requires fairly liberal seeding and a reasonably good tilth. The crop will occupy the ground for a very much shorter time, there will be fewer tillers, and a less extensive root system, and consequently readily available manure is important if a full crop is to be obtained.

It is generally thought that during last autumn more than the usual proportion of the arable land was sown with wheat, and in order to distribute the risks on cereal growing there are many farmers who will confine their attention now to barley and oats.

Barley.—The choice between barley and oats depends very much on district, or climate and soil. In the counties bordering the east coast from the Thames to the Tees, barley is the most important spring cereal. A dry climate and light to medium soils are most suitable for this crop. Under such conditions it can thrive relatively better than either wheat or oats, while the crop will be of better quality than is possible on the heavier soils and in districts of greater rainfall.

On typical barley soils the crop should be sown as early in the year as the condition of the soil will permit. Early-sown crops develop a better rooting system, as during March and April growth is relatively greater in the root system than in the stem and leaf, and the crop is thus better equipped to search for nutriment and is fortified to a much greater extent against drought—both by reason of the more extensive root system and by the more advanced stage of the top growth protecting the soil from the bright sunshine that usually prevails in dry periods in early summer. On the heavier soils early sowing is not so advantageous as such soils are slower to warm up, and the steady continuous growth so essential to the production of barley of good quality may not be attained.

Good tilth is always important, but the heavier soils are usually later in coming into condition, though the later sowing

may be just as successful where the soil is of such a type that it can withstand the effects of drought.

Oats.—Oats are less exacting in their requirements, both as to soil and rainfall. Cool, moist conditions are favourable to oats, and the crop is less exacting as to the lime content of soils. Soils rich in organic matter suit the oat crop better than any of the other cereals, and for that reason oats are preferred on newly-broken ley. A firm seedbed and early sowing are desirable. On a ploughed ley it is often difficult to get the land firm enough; furrow-pressing is a common practice in the south, and in some seasons makes all the difference between success and failure.

Firmness of seedbed is more important to the early-sown crops when first growth is slow until the soil warms up. Damage from wireworm and leatherjacket is minimized by securing a firm seedbed. On land badly infested with these pests early sowing is not always an advantage, and possibly the best practical means of fighting such pests is to sow moderately early on a good firm seedbed with a good tilth, and to give an adequate supply of readily-available manure at the time of seeding. On the other hand, late sowing should be avoided, if possible, as the likelihood of damage being done to the oats by the Frit Fly is very much greater with late-sown oats. On land that must be sown late the risk of material damage being done by Frit Fly is such that it is often much more profitable to grow a crop of barley even though the barley is only of feeding quality.

The rate of seeding of oats is extremely varied, rates between 4 and 7 bus. per acre being common. Variation is justified according to the type sown, since there are considerable differences in the size of grain and in the tillering capacity of the types. The large-grained varieties are often the poorest in tillering qualities, and there is therefore a double reason for heavy seeding.

Generally speaking, early-sown oats are seldom sown quite thick enough, or at least the plants are seldom thick enough when real growth commences. The death rate in early-sown oats appears to be unduly high in some years. O'Brien found that oats affected with Leaf Stripe Disease were apt to succumb before the seedlings were through the surface of the soil, and as a result of his work the dressing of seed oats is now widely practised. It is stated, however, that the full advantage of dressing has not been obtained where the farmer has continued to sow the same liberal quantities of seed as was usual when the seed was sown in an undressed condition.

Forage Crops.—Under this heading may be included crops that are grown for the specific purpose of providing food for stock, whether as grain, silage or freshly-cut green food.

Mixed cereal crops, often referred to as dredge corn, and usually a mixture of oats and barley, are commonly grown for the use of stock.

When the straight cereals cannot be marketed to advantage and the type of farming is mainly concerned with live stock, a mixed cereal crop of this kind is decidedly popular. On the poorer high-lying lands a mixed cereal crop is favoured because the risk of failure is much reduced as compared with oats or barley grown singly. In addition, the total weight of grain, at any rate under adverse circumstances, is greater than would be obtained by the pure cereals.

The oat is a deeper rooted plant than barley and consequently the root system of a mixed crop is more evenly distributed in the soil, and better use is made of the available plant food. The top growth has a varied height during growth and there is much less risk of lodging during bad weather. Cultivation is the same as for spring cereals generally, the crop being sown in March or early April. The mixture most commonly grown consists of oats and barley, but wheat is sometimes included. Too complex a mixture is not advisable, as it is essential that the varieties used should ripen as nearly as possible simultaneously. Equal quantities of barley and oats make a useful mixture, although some farmers prefer a higher proportion of oats; others prefer a preponderance of barley. The heaviest crop of grain is usually obtained from a mixture consisting of two-thirds oats and one-third barley. The normal rate of seeding is 4 bus. per acre.

Mashlum.—A more complex mixture that includes not only cereals such as oats and barley, but pulse crops such as peas, beans, or even tares, produces useful stock food. Such a mixture is called mashlum. As a stock food it is of greater all-round usefulness than dredge corn.

Many parts of the country are not well suited for growing peas or beans as pure crops, and even under favourable circumstances these crops are notoriously fickle. In mixture with cereals, peas and beans grow comparatively well. The main difficulty is to obtain a mixture that will ripen uniformly. Beans are the principal trouble in this respect, and their longer growing period can to some extent be met by sowing them a fortnight or three weeks before the main ingredients. In addition, late-ripening cereals may be selected.

The mixture of seeds can be varied to suit the local conditions. A simple mixture is 3 bus. of oats and from $\frac{1}{2}$ to 1 bus. of peas. The cercal may be a mixture of oats and barley, and the pulse either peas or beans or a mixture of these. Various uses can be made of the crop; it can be cut green as forage; if beans are not included it can be cut when the peas begin to flower and made into hay; it can be cut green and made into silage; or it can be allowed to ripen and be threshed to provide useful concentrated food for stock.

Silage Crops.—Many kinds of crop are suitable for silage. The immediate matter is to consider crops that must be sown now especially for the purpose of ensilage. Dredge corn is suitable and, as already indicated, mashlum crops can also be utilized for ensiling if cut green. When, however, it is definitely intended that the crop shall be made into silage a mixture containing tares can be highly recommended. Tares produce a large amount of green forage, but their weak stems are apt to lodge badly and cause a reduction of leaf on the lower portion, as well as a rotten condition.

The composition of a silage mixture should be such as to provide a maximum of tares that can be held up by beans or cereals. It is difficult to predetermine such a mixture, because the individual ingredients vary in growth according to weather conditions and the same mixture may give a preponderance of cereals in one year and be swamped by tares in another. A tall-growing leafy type of oat should be selected and a safe mixture is three parts of cereal to one of tares.

In autumn-grown crops equal weights of beans and tares can be used. In spring-sown crops beans may also be used, but unless they are sown a few weeks before the tares they are apt to be smothered.

For silage crops heavy seeding is advisable, as although the crop may become slightly laid it should be ready for cutting before it gets down too flat or at any rate before it has time to spoil by rotting.

On light or poor land 3 bus. of oats and 2 bus. of tares might be suitable, but on richer land the tares should be reduced and the oats increased, so that on good medium soils the mixture might be 4 bus. of oats and 1 bus. of tares. When beans are introduced the other ingredients should not be materially decreased, as the chances for their success in spring-sown crops is rather doubtful.

When they are properly grown, silage crops assist materially in cleaning land of weeds, and it is often advisable to manure the silage crop in order to increase its smothering power so that weeds are more readily dealt with afterwards.

PRICES OF ARTIFICIAL MANURES

Average price per ton during week
ended January 4.

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	8 14d	8 14d	8 14d	8 14d	11 3
" " Granulated (N. 16%) ..	8 14d	8 14d	8 14d	8 14d	10 10
Nitrate of lime (N. 13%) ..	..	..	..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	6 5d	6 5d	6 5d	6 5d	6 1
Calcium cyanamide (N. 20·6%) ..	7 0e	7 0e	7 0e	7 0e	6 10
Kainit (Pot. 14%) ..	3 10	3 5	3 2	3 7g	4 9
Potash salts (Pot. 30%) ..	5 13	5 10	5 7	5 11g	3 8
" " (Pot. 20%) ..	4 1	3 17	3 14	3 19g	3 11
Muriate of potash (Pot. 50%) ..	10 9	10 2	9 15	10 5g	4 1
Sulphate " " (Pot. 48%) ..	12 5	12 0	11 15	12 3g	5 1
Basic slag (P.A. 15½%)|| ..	2 10c	2 0c	..	2 6c	2 11
" " (P.A. 14%)|| ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26-27½%)|| ..	2 10a	2 1a	2 9a	2 7a	1 9
Superphosphate (S.P.A. 16%) ..	3 2	..	..	2 16k	3 6
" " (S.P.A. 13½%) ..	2 17	2 9	..	2 12k	3 10
Bone meal (N. 3½%, P.A. 20½%) ..	6 10	6 5	..	6 7	..
Steamed bone-flour (N. 4%, P.A. 27½-29½%) ..	5 15	5 2	5 2	5 5	..

Abbreviations : N. = Nitrogen ; P.A. = Phosphoric Acid ; S.P.A. = Soluble Phosphoric Acid ; Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

† Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

|| Fineness 85% through standard sieve.

a Prices for 4-ton lots f.o.r. At London the prices shown are f.o.r. on northern rails southern rails, 2s. 6d. extra.

c Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra and for lots of 10 cwt. and under 1 ton 15s. extra.

g Prices shown are f.o.r. northern rails; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails, southern rails, 1s. 3d. extra.

NOTES ON MANURES

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Barley.—The barley crop, coming as it usually does after a well done crop of potatoes, sugar-beet, or roots, is quite frequently grown without manure. The well-known fact that dunging or heavy sheeping leads to loss of malting quality also lends support to the practice of restricted manuring for this crop. Moreover, many trials on good, highly-farmed land, that receives generous mineral manuring for roots, indicate that the yield response to potash and phosphate is quite small. In 1930–31 there have been five experiments on similar lines at three centres bearing on this point. The treatments were (1) no potash or phosphate, (2) potash, (3) phosphate, (4) potash and phosphate. These were applied without nitrogen and in conjunction with each of three different sources of nitrogen, in adequate replication. The over-all effects of phosphate and of potash were quite slight, and came out as follows (yields per acre):—

BARLEY					
Wellingore (Lincs) and Sparsholt (Hants), 1930 and 1931 ; Wye College, 1931					
		Gram	Straw	Increase	
		bus.	cwt.	bus.	cwt.
No phosphate .. ..	..	39.0	23.1		
3 cwt. superphosphate ..	..	39.5	23.7	0.5	0.6
No potash .. ..	..	38.7	23.2		
1½ cwt. sulphate of potash		39.8	23.5	1.1	0.3

These figures, each resting on 160 plots, give a fairly good picture of the general effects over the conditions sampled. Closer examination of the detailed effects brings out two that were significant on the individual experiments.

At Wellingore on light limestone loam in 1930 potash gave a significant improvement in the grain, but only in presence of nitrogen:—

	With nitrogen	Without nitrogen
No potash	30.3 bus.	21.4 bus.
1½ cwt. sulphate of potash .	34.2 „	19.8 „

At Sparsholt, 1930, on a light clay loam, superphosphate gave a definite increase only in presence of potash and nitrate of soda.

The yields were:—

	Sulphate of Potash + Nitrate of Soda	
	Grain, bus.	Straw, cwt.
No phosphate	28.0	14.4
3 cwt. superphosphate	33.6	16.9

The nitrogen effects were much more definite and came out clearly over all the experiments, and showing both in grain and straw. The figures were :—

					Ratio of grain to 100	
	Grain bus.	Straw cwt.	Increase bus.	cwt.	parts straw	
No nitrogen	36.0	20.5	—	—	87	
Nitrate of soda, $1\frac{1}{2}$ cwt.	41.2	25.4	5.2	4.9	81	
Sulphate of ammonia, 1 cwt.	40.4	24.4	4.4	3.9	83	
Cyanamide, 1 cwt.	39.4	23.2	3.4	2.7	85	

Each form of nitrogen increased grain and straw in the order usually observed when the manures are applied on an equal nitrogen basis, nitrate first, then sulphate, and finally cyanamide. Nitrogen always increases straw rather more than grain, the order still being in accordance with the degree of activity. Provided that the crop stands up at harvest and a good growing season is encountered, the effect of nitrogen on the quality of the grain is negligible, but obviously nitrogen should not be used on tilths already in high condition, and in any case the dose should not exceed 1 cwt. of sulphate of ammonia or its equivalent per acre. The time to apply it is in the seed bed before sowing. When the land is somewhat impoverished—as, for example, after a previous straw crop—a mixture worth trying would be 1 cwt. sulphate of ammonia, 2 cwt. superphosphate, and $\frac{1}{2}$ cwt. muriatic of potash per acre. The potash might be increased to 1 cwt. on light sharp soils or on chalky land.

Flue Dust.—Inquiries have recently been received as to the manurial value of flue dust, for a certain amount of this material is likely to be on sale as a potassic fertilizer. A few notes on blast-furnace flue dust may, therefore, be useful. The study of the refining or the direct utilization of the potash contained in blast-furnace flue dust was taken up during the period of acute potash shortage in the allied countries during the Great War.* The charge of iron ore, coke, and limestone fed into the blast furnace contains a small proportion of potash. At the high temperature of the furnace some of this potash is volatilized and condenses in the upper and cooler parts of the furnace, chiefly in the form of sulphate and chloride of potash. The condensed potash compounds, together with a considerable

* British papers: H. T. Cranfield, this JOURNAL, Vol. 24, 1917, p. 526; R. A. Berry and D. N. McArthur, *Jour. Soc. Chem. Ind.*, Vol. 37, 1918, p. 1. American papers: A. R. Merz and W. H. Ross, U.S. Dept. Agric., Bull. 1226, 1924.

amount of mineral dust and a certain amount of carbon, are carried from the furnace with the hot gases. After the dust-laden gases leave the furnace, settling out of the dust takes place, and in the nearest flues about 80 per cent. of the dust settles. This fraction is blackish in colour and contains rather a small percentage of potash, say about 2.5 per cent. K_2O ; it also frequently contains traces of soluble cyanamide and sulphites, which in the fresh condition are injurious to vegetation on account of their solubility, while its low grade makes this class of dust of little importance—though a considerable quantity is produced. The gases laden with the finer dust are then burnt under boilers and a further flue dust is deposited, red in colour and richer in potash, say about 7 per cent. K_2O . The combustion tends to remove injurious impurities and the grade is better. Still another deposit forms in the flues leading to the smoke stack. This is usually the richest in potash (containing about 10 per cent. K_2O) and is light coloured.

Although for every ton of pig iron produced about 13 lb. K_2O are put into the furnace, only about 5 lb. K_2O leave the furnace in the gases, and of this quantity no more than one-fifth is deposited as the better-grade dusts. The high-grade dusts containing 10 per cent. of K_2O and over, only account for a trifling percentage of the total potash leaving the furnace. Several methods have been proposed for potash recovery from these dusts, and in any case the removal of the dust from the furnace gases is desirable on technical grounds. These methods involve the production of crude sulphate and chloride of potash in approximately the same concentration as the ordinary high-grade potash fertilizers. During the war a beginning was made in this direction. At present, with abundant supplies of natural potash salts, there is little need to exploit these means of recovery. There is still the possibility of using the high-grade dusts for direct application to the land. They contain from 10 to 15 per cent. of K_2O , of which perhaps 50 to 70 per cent. is water-soluble and presumably of much the same activity as the ordinary salts of potash. Of the availability of the balance of the potash to the plant, little appears to have been reported, although this is a point of some importance. The dusts contain nothing else of manurial value but a little lime, which is no doubt of some slight value. There is the possibility of the presence of injurious substances, but contact with the soil soon renders these innocuous. Flue dusts can never be preferable to the ordinary sources of potash when compared on an equal potash basis. If offered at a unit price considerably cheaper

than the cheapest natural potash salt in the market (January 4, 30 per cent. potash salt 3s. 8d. per unit) they might be given a trial, but as a safeguard they should be applied some time before sowing.

The Action of Potash.—Some interesting figures relating to the yield increases following the use of potash under ordinary farm conditions in Germany have recently been published in an account of the field experiments carried out by the Deutsche Landwirtschafts Gesellschaft in 1931.* In comparison are given the average results of 375 similar experiments involving potash carried out by the same body since 1919. The data are presented as kilogrammes of crop increase produced by 1 kg. of potash (K_2O) per hectare. A simple comparison enables them to be stated as cwt. of crop increase per 1 cwt. of 50 per cent. muriate of potash per acre, a more convenient form for English readers.

Increases in Crops following the Use of Potash.

Crop	1931	No. of expts.	1919 onwards.	No. of expts.	Cwt. per 1 cwt. mur. pot.
	Kg. per 1 kg. K_2O .		Kg. per 1 kg. K_2O .		
Rye	—	—	3.6	64	1.8
Wheat	3.2	15	2.7	24	1.3
Barley	(all cereals)	—	2.3	17	1.1
Oats	—	—	2.4	18	1.2
Peas, beans	—	—	2.1	5	1.1
Clover hay	12.2	7	10.0	17	5.0
Lucerne hay					
Meadow hay	9.8	12	14.0	40	7.0
Potatoes	21.2	20	22.0	173	11.0
Sugar-beet	52.2	1	35.0	3	17.5
Mangolds	115.0	3	72.0	10	36.0

The above increases were obtained in presence of nitrogen and phosphate, so that the action of potash would not be restricted through lack of the other nutrients. The general effects are similar to those observed in this country. The cereals respond to a lesser degree than the root crops, probably because grain usually follows a crop that receives both dung and potassic fertilizers. Nevertheless, on a dry matter basis the grain increases fall closer in line with those given by roots. Thus, assuming normal composition of the crops, we have:—

	Per 1 cwt. Muriate of Potash.		
	Cwt. as harvested	Dry matter per cent.	Cwt. dry matter
Cereals (mean of all)	1.4	85	1.2
Potatoes	11.0	23	2.5
Sugar beet	17.5	23	4.0
Mangolds	36.0	12	4.3

* O. Nolte : *Mitt. der D.L.G.*, 1932, p. 465.

In England, we have had more experiments with potash on potatoes than on any other crop, and an increase of 11 cwt. of potatoes per 1 cwt. of high-grade potassic fertilizer would be considered quite normal. Many experiments have been put on record in which this rate of increase is considerably exceeded.

Another point in the manuring of potatoes is well illustrated by these experiments—namely, the effect of sulphate of potash as compared with chloride of potash. The results of 93 experiments conducted by the Deutsche Landwirtschafts Gesellschaft since 1919 were as follows (yields converted to English units) :—

Potatoes.		Tons per acre	Starch in tubers per cent.
Yield with no potash .. .. .	.. .. .	8.1	16.8
Increase for 40-per cent. potash salt, cwt. per acre..	.. .. .	19	16.5
Increase for sulphate of potash, magnesia .. .. .	.. .. .	23	17.2
Increase for sulphate of potash .. .. .	.. .. .	27	17.2

The 40-per cent. salt is a muriate and stands between our 30-per cent. potash salt and muriate of potash. It is not used in this country. In spite of its rather high grade it is surpassed both in yield and in starch content of tubers by the manures providing potash as sulphate. Similar effects have been observed in this country, especially when low-grade potash salt (30 per cent. or less of K_2O) has been used.

One point of interest in the German experiment is the extraordinary difference in the number of trials conducted on potatoes and sugar-beet. Probably this is a reflection of the fact, which has often been observed in this country also, that the potato is much more certain in its responses to potassic fertilizers than the other root crops.

* * * * *

NOTES ON FEEDING

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Calf Rearing.—Certain questions have arisen in connexion with the matter that was dealt with briefly in these Notes in the JOURNAL for January. Interest in the economic methods of calf rearing appears to have been stimulated lately by some prospects of a better demand for beef, and the need for increasing the output of good stores and fat cattle within the country, together with the fact that there is meanwhile rather more milk available for feeding to stock than is usual at this season. For these reasons it may be of interest to go more fully into certain aspects of the subject.

The attention of those who are especially concerned with this matter might well be directed to the investigations that have been made relative to economic methods of rearing calves by Prof. Paterson at the West of Scotland Agricultural College. These investigations provide much valuable information that bears directly upon the points that are of the first importance to those who undertake the rearing of calves, whether it be for beef or with the object of replenishing the dairy herd.

One may recall that at one time the view held by many stock raisers in England was that calves should be housed in the gloom of semi-darkness. No doubt this idea was originally associated with the rearing of calves for veal, but it has persisted in regard to calf raising for other purposes. It will, therefore, not be out of place to stress the value of good ventilation and sunlight for all growing stock, including calves. Recent research has demonstrated the intimate connexion between sunlight and the adequate supply of vitamin D that is so necessary for the general well-being of young animals, and their assimilation of calcium. Consequently it has become quite clear that it is essential that a good calf pen should be both well lighted and well ventilated. Draughts and cold damp beds have been recognized as causes of trouble, and if the floor of the calf pen is of concrete, it is a good plan to cover it with a 3-in. layer of peat moss with straw on top. This provides additional warmth, and the peat moss acts as a valuable deodorizer.

In the Notes for January, Mackenzie was quoted as having reckoned that a calf fit for the production of baby beef could be reared on 150 gallons of milk. By baby beef it is presumed that Mackenzie had in mind the young beast that would be fit for slaughter for prime beef of its class at 15 months old.

Paterson's investigations have shown that suckled calves receiving an estimated quantity of 100 gallons each may be fit for beef at 18 to 20 months old. On this basis a cow giving 800 gallons would, with proper management, be capable of rearing 8 calves in a season. It must be realized, however, that to rear 8 calves successfully on an 800-gallon cow, close attention and intelligent care are required. If a cow is giving, early in her lactation, 4 gallons a day, and is milking evenly on all four quarters, she can suckle 4 calves at one time as the first batch.

With this intensive suckling method, the calves should not be allowed to run with the cow, but should be given access to her at definite suckling times only. At first, at least, it is preferable that they should be allowed to suckle three times daily. When the calves are not allowed to run continuously with the cow, there is less difficulty when one group is being weaned, and a second group is introduced. One lot of calves is generally allowed to suckle for from 12 to 14 weeks. When the change from one group to another is being made, the fresh calves are given access to the cow first, but not left long enough to suckle her dry; the older calves are then put to her to "strip out" the richer last-drawn milk. This goes on for a few days, or a week, until the younger calves get accustomed to the milk and can take all of it, but it is very important that the stockman should continue to see that the cow is suckled dry at each time of suckling. If not, she must be stripped by hand. Calves reared in this way will eat trough food from a month old, or earlier. By weaning time they should be eating daily about 2 lb. of a suitable concentrated mixture, and, if indoors, should be given, in addition, as much hay as they will readily clear up, together with a moderate allowance of suitable roots or green stuff.

Milk is generally scarce in the autumn, so that cows in milk are dear and calves cheap. Consequently, if one can arrange to have cows for suckling, calving in the autumn, the cheaper rate at which the first group of calves can be bought, and the greater yield of milk obtained in the lactation, compensate for the more costly feeding of the cow in the winter months. Generally, calves born from February 1 onwards are more easily reared, but the autumn ones profit most from the following summer's grass.

As regards hand rearing, the usual practice in dairy herds throughout the country seems to be to give whole milk for about 8 weeks. For the first month the quantity averages

about a gallon per day, with a gradually reduced allowance in the second month. In a series of experiments conducted at various centres throughout the country, whole milk was given for the first month, and after the calves were 4 weeks old a comparison was made of whole milk fed to one lot, and separated milk plus crushed oats fed to another lot. The average daily increases of the calves over periods of 14 weeks were, whole milk ration 1.96 lb. per day; separated milk plus crushed oats ration, 1.80 lb. per day. From these figures it will be seen that the calves on the separated milk and crushed oats did quite reasonably well, compared with those on whole milk. Separated milk, with a supplement such as crushed oats to replace the butter fat, appears to be a quite satisfactory food, so that the older method of feeding separated milk and gruel, to replace whole milk, may be dispensed with as involving unnecessary labour.

A trouble is that this method of feeding is only of limited application because few farms have a supply of separated milk. In order to secure such a supply a sufficiently attractive market for the cream, either in its natural state or as butter, is necessary. Possibilities of successfully improving the market for butter would not appear to be very great, but there should be an increasing demand for the thinner type of cream which has "caught on" in certain districts. This thinner cream is sold with 17-20 per cent. of butter fat, and can be provided at a price that is within the means of many more purchasers than is the conventional type of thick cream which, containing 50 per cent. of butter fat, can only be offered at a price that results in its being, definitely, a luxury.

In order to find a substitute to replace separated milk on milk-selling farms, a trial was recently carried out on the West of Scotland College farm. Three rations were compared after the calves were 4 weeks old, namely, whole milk, separated milk and dried milk powder reconstituted with water. For the first 4 weeks all the calves were given whole milk; thereafter whole milk was continued to the calves in Group I, but was gradually replaced with separate milk in the case of the calves in Group II, and with the reconstituted dried milk for those in Group III. The dried milk was reconstituted in the proportion of 1 lb. of dried milk with 9 lb. water, to provide the equivalent of 1 gallon of separated milk. All the calves received a mixture consisting of 2 parts of linseed cake, 2 parts of flaked maize, and 1 part of bran. The allowance of this mixture was $\frac{1}{2}$ lb. per calf per day during

the 5th week and gradually increased by $\frac{1}{4}$ lb. per week. Hay was also given, as much as the calves would clear up, and gradually reached 2 lb. per calf per day. The system of feeding was continued for a period of 15 weeks, and by the end of that time the following quantities had been consumed :—

<i>Group I.</i>	..	100	gals.	of whole milk.
<i>Group II.</i>	..	50	" "	" " and
		50	" "	separated milk.
<i>Group III.</i>	..	50	" "	whole milk and
		50	" "	reconstituted separated milk.

The respective live-weight increases per calf per day during the trial period were : Group I, 1.78 lb. ; Group II, 1.68 lb. ; Group III, 1.70 lb. From the point of view of cost, the advantage lay with the separated milk and milk powder rations, but the trial also demonstrated that dried milk powder may be successfully used for calf rearing after the first 4 weeks. The cost of the milk powder was 25s. per cwt., or 2.7d. per reconstituted gallon, as compared with separated milk at 2d. per gallon.

Importance of Water.—An additional feature of interest in this trial was that from the 5th to the 15th week the calves had access to water bowls. The water passed through meters, and in this way the water consumption was ascertained to be, per calf, per day, as follows : Group I, 1.72 gallons ; Group II, 1.78 gallons ; Group III, 1.78 gallons. In the 15th week the consumption was actually well over three gallons per calf per day. This is a point to which due importance ought to be attached. It is by no means uncommon to find that strong views are held by calf rearers that in the early stages water should be entirely withheld or strictly limited, as it is blamed for causing scour and for making the calves pot-bellied. The satisfactory daily increases secured in this experiment should be carefully noted in relation to the general management, as regards concentrated food, hay and water. When it is realized that these calves were drinking fully three gallons daily at between three and four months old, it will become clear that on many farms where calves have not constant access to a supply of water they must frequently go short of their requirements. Water is the cheapest ingredient which goes to the production of live-weight increase, and the publication of the foregoing figures should do something to dispel a belief that appears to be widely held, that unlimited water is "not good for" calves.

DESCRIPTION	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	5 7	0 10	4 17	72	1 4	0-71	9-6
Barley, British feeding ..	5 10	0 8	5 2	71	1 5	0-76	6-2
" Canadian No. 3 Western ..	6 2	0 8	5 14	71	1 7	0-85	6-2
" Danubian	5 7½	0 8	4 19	71	1 5	0-76	6-2
" Russian	5 12*	0 8	5 4	71	1 6	0-80	6-2
Oats, English white	6 7	0 8	5 19	60	2 0	1-07	7-6
" black and grey	6 0	0 8	5 12	60	1 10	0-98	7-6
" Scotch white	7 0	0 8	6 12	60	2 2	1-16	7-6
" Canadian No. 2 Western ..	6 15	0 8	6 7	60	2 1	1-12	7-6
" No. 3	6 5	0 8	5 17	60	1 11	1-03	7-6
" mixed feed	4 18	0 8	4 10	60	1 6	0-80	7-6
" Argentine	5 13	0 8	5 5	60	1 9	0-94	7-6
" Chilean white	7 17†	0 8	7 9	60	2 6	1-34	7-6
Maize, Argentine	4 13	0 8	4 5	78	1 1	0-58	7-6
" Russian	4 3½	0 8	3 15	78	1 0	0-54	7-6
" Danubian	4 5½	0 8	3 17	78	1 0	0-54	7-6
Beans, English winter	5 10½	0 19	4 11	66	1 5	0-76	19-7
Peas, Indian	9 5†	0 16	8 9	69	2 5	1-29	18-1
" Japanese	33 5†	0 16	32 9	69	9 5	5-04	18-1
Dari	8 5†	0 9	7 16	74	2 1	1-12	7-2
Milling offals—							
Bran, British	5 15	0 19	4 16	43	2 3	1-20	9-9
" broad	6 15	0 19	5 16	43	2 8	1-43	10
Middlings, fine imported ..	5 15	0 14	5 1	69	1 6	0-80	12-1
" coarse British	5 12	0 14	4 18	56	1 9	0-94	10-7
Pollards, imported	5 2	0 19	4 3	62	1 4	0-71	11
Meal, barley	7 15	0 8	7 7	71	2 1	1-12	6-2
" Grade II	7 0	0 8	6 12	71	1 10	0-98	6-2
" maize	5 12	0 8	5 4	78	1 4	0-71	7-6
" South African	5 2	0 8	4 14	78	1 2	0-62	7-6
" germ	6 2	0 13	5 9	79	1 5	0-76	8-5
" locust bean	6 7	0 6	6 1	71	1 8	0-89	3-6
" bean	8 0	0 19	7 1	66	2 2	1-16	19-7
" fish	14 10	2 14	11 16	59	4 0	2-14	53
Maize, gluten feed	6 5	0 14	5 11	76	1 6	0-80	19-2
" cooked flaked	6 7	0 8	5 19	84	1 5	0-76	9-2
Linseed cake, English, 12% oil ..	8 7	1 3	7 4	74	1 11	1-03	24-6
" " " 9% "	8 2	1 3	6 19	74	1 11	1-03	24-6
" " " 8% "	7 17	1 3	6 14	74	1 10	0-98	24-6
" " " 6% "	8 2½	1 3	6 19	74	1 11	1-03	24-6
Soya bean cake, 5½% oil	7 17†	1 11	6 6	69	1 10	0-98	36-9
Cottonseed cake—							
English, 4½% oil	5 17	1 3	4 14	42	2 3	1-20	17-3
Egyptian, 4½% oil	5 7	1 3	4 4	42	2 0	1-07	17-3
decorticated, 7% oil	7 10†	1 12	5 18	68	1 9	0-94	34-6
Cottonseed meal decorticated, 7% oil	7 10†	1 12	5 18	68	1 9	0-94	34-6
Coconut cake, 6% oil	6 15†	1 0	5 15	77	1 6	0-80	16-4
Ground-nut cake, 6-7% oil	7 15†	1 0	6 15	57	2 4	1-25	27-3
" " decorticated, 6-7% oil	8 0	1 11	6 9	73	1 9	0-94	41-3
Palm-kernel cake, 4½-5½% oil ..	6 5½	0 13	5 12	73	1 6	0-80	16-9
" " meal, 4½% oil	6 15½	0 13	6 2	73	1 8	0-89	16-9
" " meal, 1-2% oil	5 12	0 14	4 18	71	1 5	0-76	16-5
Feeding treacle	5 0	0 9	4 11	51	1 9	0-94	2-7
Brewers' grains, dried ale	6 5	0 14	5 11	48	2 4	1-25	12-5
" " porter	5 15	0 14	5 1	48	2 1	1-12	12-5
Dried sugar beet pulp (a)	5 5	0 7	4 18	66	1 6	0-80	5-2

* At Bristol.

† At Liverpool.

‡ At Hull.

(a) Carriage paid in 4 ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of December, 1932, and are, as a rule, considerably lower than the prices at local country markets, the difference being due toriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer by their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 23s. per ton as shown above, the food value per ton is £3 17s. Dividing this by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 6d. Doing this again by 23-4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 4d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same basis. From the results of such calculation a buyer can determine which feeding stuff gives him the best value for the money. The prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are based on the basis of the following unit prices:—N. 6s. 1d. : P.O.s. 3s. 6d. : K.O. 3s. 6d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	5 14
Maize	78	7.6	4 7
Decorticated ground-nut cake ..	73	41.3	8 0
„ cotton cake	68	34.7	7 10

(Add 10s. per ton, in each case, for carriage.)

The cost per unit starch equivalent works out at 1.30 shillings, and per unit protein equivalent, 1.92 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The “food values,” which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1932, issue of the Ministry's JOURNAL, p. 781.)

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	5 12
Oats	60	7.6	4 13
Barley	71	6.2	5 4
Potatoes	18	0.8	1 5
Swedes	7	0.7	0 10
Mangolds	7	0.4	0 10
Beans	66	19.7	6 4
Good meadow hay	37	4.6	2 17
Good oat straw	20	0.9	1 8
Good clover hay	38	7.0	3 3
Vetch and oat silage	13	1.6	1 0
Barley straw	23	0.7	1 11
Wheat straw	13	0.1	0 17
Bean straw	23	1.7	1 13

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 6d. net.

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MISCELLANEOUS NOTES

THE general index number of agricultural produce for December rose by 2 points on the month to 103, but was 14 points lower than a year ago. Increased

The Agricultural Index Number prices for fat stock and a slight rise in the average for milk were the chief factors causing the advance, although these were offset to some extent by the lower quotations recorded for barley, oats, and eggs.

Monthly index number of prices of Agricultural Produce. (Corresponding months of 1911-13=100.)

Month	1927	1928	1929	1930	1931	1932
January	149	145	145	148	130	122
February	145	143	144	144	126	117
March	143	145	143	139	123	113
April	143	151	146	137	123	117
May	142	154	144	134	122	115
June	141	153	140	131	123	111
July	142	145	141	134	121	106
August.	142	144	152	135	121	105
September	143	144	152	142	120	104
October	140	139	142	129	113	100
November	137	141	144	129	112	101
December	138	140	143	126	117	103

Grain.—During December barley averaged 6s. 11d. per cwt. or 5d. cheaper than in November while oats at 5s. 8d. were reduced 3d. per cwt., the index for the former being 2 points lower at 84 and for the latter 4 points lower at 81. The fall of 2d. to 5s. 3d. per cwt. in the case of wheat, however, was similar to that which occurred in December, 1911-13, and the index remained unaltered at 72. A year ago the indices for barley, oats and wheat stood at 86, 102 and 99 respectively.

Live Stock.—A seasonal advance occurred in the price of fat cattle, which at an average of 36s. 2d. per live cwt. was 2s. 3d. per cwt. higher; the rise was proportionate to that in the base period so that the index remained unchanged at one point above pre-war. Fat sheep were dearer by $\frac{3}{4}$ d. per lb. and were 4 points higher at 91; a year ago, however, the index fell by 7 points to 106. Both bacon and pork pigs advanced sharply in price, the former by 9d. and the latter by 1s. 3d. per score, and the relative indices rose by 7 and 11 points to 92 and 103. As compared with December, 1931, baconers were 5 points higher, but porkers were unchanged. Except for dairy cows which were reduced by 9s. per head and fell 3 points to 114, all classes of store stock were dearer on the month. Store cattle realized 15s. per head more than in November while an increase of fully 3s. per head in the price

of store pigs caused the index to rise 13 points to 108. Store sheep were about 2s. per head dearer, but were still 28 per cent. cheaper than pre-war.

Dairy and Poultry Produce.—The price paid for milk delivered under contract during December averaged slightly more than in November and the index was 3 points higher at 155. In the corresponding period last year there was a rise of 29 points to 150. Butter advanced one point to 98, but cheese fell by a similar figure to 114. A considerable reduction, amounting to about 4d. per dozen, occurred in the quotation for eggs and the index was reduced by as much as 20 points to 92. In December of last year a fall of 30 points to a level of 93 was recorded. All classes of dead poultry made slightly more money, but as the increases were not proportionately so large as in the pre-war years, the indices receded and the combined index of 115 for poultry was 6 points lower than in November.

Other Commodities.—Potatoes averaged about 1s. 6d. per ton less than in the previous month and the index was 3 points lower at 120 or less than half that for December, 1931. There was no change in hay or wool, the indices remaining at 67 and 62 respectively. As regards vegetables, cauliflowers and onions were dearer and the combined index was 7 points higher at 124.

Monthly index numbers of prices of individual commodities. (Corresponding months of 1911-13 = 100.)

Commodity	1930	1931	1932			
	Dec.	Dec.	Sept.	Oct	Nov.	Dec.
Wheat	83	86	76	75	72	72
Barley	100	102	103	95	86	84
Oats	80	90	96	90	85	81
Fat cattle	120	110	112	102	101	101
„ sheep	144	106	86	83	87	91
Bacon pigs	126	87	84	82	85	92
Pork „	153	103	87	88	92	103
Dairy cows	130	125	112	118	117	114
Store cattle	122	117	109	100	97	103
„ sheep	150	101	80	72	70	72
„ pigs	204	120	86	89	95	108
Eggs	114	93	124	121	112	92
Poultry	131	130	124	126	121	115
Milk	165	150	150	145	152	155
Butter	112	110	94	95	97	98
Cheese	116	111	116	114	115	114
Potatoes	149	259	114	120	123	120
Hay	93	77	69	67	67	67
Wool	81	79	62	62	62	62

National Agricultural Show, Berlin, 1933.—The Thirty-ninth Annual Exhibition organized by the German Agricultural Society will take place in Berlin from May 20-28 next. Practically every branch of the industry will be represented, including artificial fertilizers, canned goods, cattle, dairying, goats, horses, horticulture, poultry, small holdings, timber, tobacco and viticulture. There will also be exhibits illustrating agricultural labour and machinery, advertising, co-operative trading, domestic science, educational material, experiments, housing and wireless. A reduced fee will be charged for foreigners requiring a German visa on their passports. Full particulars regarding accommodation, travel routes, and all other matters relating to this exhibition may be obtained on application to the Secretary, Deutsche Landwirtschafts-Gesellschaft, Dessauer Strasse 14, Berlin, S.W. 11.

* * * * *

Enforcement of Minimum Rates of Wages.—During the month ended January 14, legal proceedings were taken against two employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee area	Court	Fines imposed			Costs allowed			Arrears of wages ordered			No. of workers involved
		£	s.	d.	£	s.	d.	£	s.	d.	
Cornwall	St. Austell	3	0	0	0	4	0	12	16	10	2
Gloucester	Littledean	1	0	0	0	10	0	22	11	1	1
		£4	0	0	£0	14	0	£35	7	11	3

* * * * *

Foot-and-Mouth Disease.—Since December 29, 29 cases of foot-and-mouth disease have occurred in England. The majority of these cases have been in the southern part of England, particularly in Wilts, Hants, Berks, Middlesex, Kent and Sussex, but cases have also occurred in the Midlands and as far north as the West Riding of Yorkshire. The usual Infected Area Restrictions were imposed on areas surrounding all the infected places.

Inquiries made by the Ministry made it apparent that many consignments of animals which had passed over the railway loading docks at Reading to various destinations might have become infected with foot-and-mouth disease, and it was, therefore, decided, on January 11, with the object of preventing the widespread dissemination of the disease, to make a Standstill Order applying to the whole of England south of the Humber, with the exception of the counties of Cheshire, Salop, Hereford, Monmouthshire, Devon and Cornwall. Since that Order was made, 21 outbreaks were confirmed, all within the Controlled Area.

The area subject to control was reduced in size successively on January 19, 23 and 26, so that, on the last date, the area comprised only a small district around Reading, covering parts of the counties of Berks, Bucks, Oxford and Hants.

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APPOINTMENT

COUNTY AGRICULTURAL EDUCATION:

ENGLAND

Lincolnshire (Holland): Miss M. E. Bettinson has been appointed Manager-Recorder of Egg-laying Trials.

NOTICES OF BOOKS

The H.E.A. Year Book. The Annual Publication of the Horticultural Education Association. Vol. I. Edited by R. T. Pearl. Pp. xl+92. (Obtainable from the Editor, South-Eastern Agricultural College, Wye, Kent. 1932. Price 3s. 6d.)

The Horticultural Education Association has now grown so much that it has been found desirable to issue an annual publication, the first number of which was recently published. The Association aims at making this Year Book a means of interchange of news and views of the different educational elements comprising its membership, while also appealing to a larger public. The contributions cover a wide range of subjects such as research problems ("The Effects of Orchard Factors on the Storage Qualities of Fruits"), educational questions ("County Horticultural Plots") and County Surveys of commercial horticulture, of which those for Cornwall and Hertfordshire are included in this number. The County Horticultural Surveys are likely to be most valued by those outside the Association, for no existing journal contains records of County Horticulture and County Instructors' work. Developments of County Surveys may be hoped for in future numbers. As a Year Book for the members of the Association, the comprehensive list of subjects must be of considerable value, for the horticulturist is by nature a stay-at-home man, while the educationist must have wide interest in all phases of scientific horticulture.

The Distribution of Consumable Goods. By D. Braithwaite and S. P. Dobbs. Introd. by P. Sargent Florence. Pp. xiii+304. (London: George Routledge & Sons, Ltd. 1932. Price 10s. 6d.)

This interesting analysis of distributive methods is the joint work of the late Mrs. Dorothea Braithwaite and of Mr. S. P. Dobbs of the staff of Messrs. Cadbury Brothers. It is a detailed study of the part played in distribution by the producer, the wholesaler and the retailer and, following closely upon the publication of Mr. Neale's book on Retail Distribution, is a significant indication of the attention that we are beginning to give to the retail end of the marketing chain.

The authors' general attitude to their problem may be illustrated by quoting from their final paragraph. "We end this book, as we began it, by suggesting that at the moment we are between the devil and the deep sea—in distribution as in most other things in life. There is too much rigidity to be compatible with free competition, with the result that competition is driven into wasteful channels; and there is not yet that far-reaching measure of control towards which the world is certainly moving."

As its title denotes, the book deals only with the marketing of consumable goods as distinct from raw materials and producers' goods. In its general plan, it follows the orthodox lines of functional analysis and contains a wealth of valuable comparative material drawn from a wide range of trades. The careful theoretical analysis of the operations of the various intermediaries in the distributive process, however, lifts it above the plane of a purely descriptive survey.

Those who are engaged in agricultural marketing will be particularly interested in the comparison of the methods of direct selling to the retailer and of sale through wholesale channels. While definitely critical of certain aspects of wholesale trading, the authors show clearly the inherent strength of the wholesale position. Moreover, they make an important contribution to discussion of the function of advertising in distribution, and while fully appreciating the part it plays and can

play as a means of bringing "intelligence to the consumer," they question how far certain forms of advertising promote efficiency.

It is interesting to note that in the preface the Orange Books of the Ministry of Agriculture are referred to as reports "which constitute a milestone for the student of marketing methods in this country; and it is only to be regretted that similar information is not available in the case of manufactured articles."

The Common Earth. By E. L. Grant Watson. Introd. by T. Sturge Moore. Pp. xi+147. (London: J. M. Dent & Sons, Ltd. 1932. Price 5s.)

This is a well written and likeable little volume, full of the joys of nature. It consists of essays originally delivered as radio "talks" in the National programme. Although it could scarcely be described as a notable addition to the literature of the subject, the field notes and observations reveal the author as a competent field naturalist, and, moreover, they are generally accurate. We must join issue with Mr. Watson, however, when he claims to have witnessed the female adder's alleged habit of taking her young into her mouth at the approach of danger. No one would wish to doubt the writer's *bona fides*, but it is worthy of note that in 1931 a correspondent of *The Field* offered a reward of £10 for an adder taken with live young in her stomach. It is understood that the reward was not claimed. The author's observations on the winter movement of birds are excellent.

The Book of the Delphinium. By J. F. Leeming. Pp. 76, illustrated. (London: Sir Isaac Pitman & Sons, Ltd. 1932. Price 3s. 6d. net.)

The Delphinium, or perennial larkspur, possesses little value as a cut flower for market, but it is a handsome and attractive plant of the herbaceous border, and has undergone considerable improvement in recent years. It is consequently much valued, and finds a place in most gardens. Mr. Leeming's little book has supplied a need, for in its pages he deals in a concise manner with the origin of the delphinium, its botanical and genetical features, its propagation, general cultivation and manurial requirements. There are useful chapters dealing with the most suitable soils for delphiniums, and the pests and diseases that attack the plants. The writer, although an amateur, is a delphinium enthusiast, and as a result the book bears the hall-mark of practical knowledge. It is also well written, attractively printed, and contains a number of interesting illustrations, some in natural colours.

The Book of the Good Sheep Farmer (*Le Livre du Bon Moutonnier*). By E. Degois. Pp. 404 and 52 figs. (Paris: Librairie Agricole de la Maison Rustique, 26 Rue Jacob, VIe. Price 20 frs.)

Professor Degois' manual aims at covering every branch of the sheep and mutton industry. Although ostensibly written from the practical point of view, and concerned chiefly with "ce qui absorbe l'activité journalière du berger," the author can be very technical at times, as e.g., in the section on "General Conformation," where he classifies the various types and breeds of sheep according to their proportions as "longilignes," "brévillignes" and "médiolignes." The same note of mathematical accuracy is observable in the tables of feeding. The descriptive chapters indicate the considerable difference that exists between British sheep-farming and the French system, with its housing of the sheep, and extensive employment of labour necessitated by such practices as suckling lambs twice or thrice a day. The difference of methods must be taken into account in comparing the sheep, mutton and lamb products of the two countries. British readers will be impressed, too, by the importance of milk and cheese production from sheep in

certain parts of France, and by the large milk yield of which ewes are capable when bred and selected for this purpose. Perhaps Professor Degois errs at times in entering into too much detail, but he has certainly succeeded in giving a comprehensive and interesting view of the industry. His book may be read with profit by sheep farmers and also by the shepherd himself if he desires to learn all he can about his craft.

Table Poultry. By J. S. Hicks. Pp. 155. Illustrated. (London : *Feathered World*, 9 Arundel Street, W.C.2. Price 2s. 6d.)

The production of table poultry has not been so extensively developed in this country as that of eggs. Numerous books have been written dealing with the latter branch of the industry, but those relating to first class table poultry are few. This brochure deals comprehensively with all phases of the table poultry industry. The opening chapters give general ideas as to the initial capital required to set up the necessary plant and the returns that, in normal times, one may expect to receive, a very vital point in these days of depressed prices. There is a full discussion of methods of fattening and cramming as practised in Sussex, the pioneer county in these matters, and useful tips are given as regards dressing, grading and marketing. Valuable information is also included concerning the wholesaler's and retailer's requirements, points of importance at the present time when foreign competition is so keen. A useful comparison between the marketing of home-produced and imported chickens should assist those at home still further to gain the confidence of the British merchant. The final chapters are devoted to ducks and turkeys, while poultry bottling and canning, so extensively practised in America, are described in some detail.

Tours in England and Wales. By Arthur Young. Series of Reprints of Scarce Tracts in Economic and Political Science : No. 14. Pp. 330. (London School of Economics, Houghton Street, London, W.C.2. 1932. Price 7s. 6d.)

The popularity of the separately published accounts of tours carried out by Arthur Young will lead readers to look forward to the perusal of the present volume with pleasant anticipation. The *Annals of Agriculture* are not, as a rule, easily accessible to the general reader, and the School of Economics has performed a work of service, both to those who admire Arthur Young and to those who are students of the agricultural and social history of his day, in producing a selection from the tours which he published in that journal. The publishers definitely state that these tours have been selected in such a way as to avoid the reprinting of those more particularly concerned with agriculture in its technical aspects, but the general reader will find that quite a large proportion of the material in this volume does, in fact, deal with that subject. Apart from that, however, Young was a man whose interests were extremely catholic ; he was not only interested in farming, but he was interested in the people who did the farming. He was a man of less fiery temper and specialized sympathies than Cobbett, and there may not be the same strain of indignation in the remarks he makes about the conditions of life in the farming community. On the other hand, a good deal of his information is much more definite. He tells us how much people spent in bread during the week, and what that bread was made of. He tells us what they spent on rent, and other things of an equally definite character, such as the price of labour, cost of provisions, materials of which the buildings were composed, prices of animals, the course of cropping, and the methods of feeding animals on the farm. Moreover, when some particular district was engaged in a specialized industry, Young did not hesitate

to introduce the details of that occupation in his remarks. It is not perhaps too much to say that farmers who may chance to read this book will find that many of the methods adopted 150 years ago are surprisingly similar to those advocated by the protagonists of the latest scientific discoveries, although the terminology is, of course, very different, and the knowledge of the reasons why certain things should be done and certain others avoided is now based upon scientific conclusions rather than upon empirical observations.

Orchard and Small Fruit Culture. By E. C. Auchter and H. B. Knapp. Second Edition. Pp. xix+580 and 278 figs. (London : Chapman & Hall, Ltd. 1932. Price 31s.)

Since its first appearance some three years ago, this work has been used in a number of American agricultural colleges as a textbook for undergraduate courses in deciduous fruit culture, but as it deals with management problems, and gives practical directions for performing many of the operations, its interest and value extend to growers also. In the present edition the statistical material and the bibliographies have been brought up to date. The authors point out that great progress has been made in studies, investigations and the accumulation of fundamental facts in many branches of fruit culture since the book was originally published. This material has been incorporated in the volume under notice, and thus made available for those who desire to keep abreast of the latest developments.

Outline of the Science of Agricultural Marketing (*Grundriss der landwirtschaftlichen Marktlehre*). By W. Seedorf and P. Hesse. Pp. xii+351 and 31 figs. (Berlin : Paul Parey, 28 and 29 Hedemannstrasse, S.W.11. 1932. Price RM. 18.40.)

In this comprehensive textbook the authors, Drs. Seedorf and Hesse, of Göttingen University, aim at providing a well-planned course for students at agricultural colleges and for others who may be interested in the subject. Discussing the general theory of marketing, they first of all classify the consuming population into purchasing groups according to their income, purchasing power, nature of diet and other factors. The farmer as producer is considered in relation to world production and markets with, of course, special reference to German conditions. A discussion of the principles of standardization leads up to an examination of the functions of the farmer as merchant, and of his relations with merchants, including co-operative associations, with special reference to the finance of marketing operations.

The authors deal with the significance of the exchange position and discuss the elements of price structure, fluctuations and margins in relation to the possibility of reducing marketing costs. Special chapters are also devoted to the significance of individual marketing by producers in local markets, on storage, preservation, conservation, etc., and the book is well illustrated with diagrams and maps. Considerable space is occupied by a discussion of the influence of the State on the market, and the authors' critical observations in this connexion are worthy of attention.

On the general premises that the first duty of the State is to safeguard the food of the people and ensure an adequate livelihood for its peasant population, the authors arrive at certain definite conclusions in regard to German conditions. Owing to the heavy burden of taxation, for example, they see no prospect of reducing costs to meet the present fall in commodity prices, and largely on that account conceive it to be the duty of the State to ensure higher prices to farmers by means of measures that define the relation between producer, merchant and consumer, or that are designed to limit the effect of foreign competition.

The authors admit that in its efforts to assist farmers the State has not always been very happy in its choice of means. They show how reciprocal commercial treaties and the operation of the "most favoured nation" provisions in many cases stultify tariff measures and react to the disadvantage of German farmers. They therefore favour the policy of quantitative limitation of imports, which has been the subject of so much recent controversy in Germany.

Retailing and the Public. By L. E. Neal. Pp. xvi+191. (London: George Allen & Unwin, Ltd. 1932. Price 7s. 6d.)

This is a book of real importance to all who are interested in the problem of distribution. It is the more impressive as being based on the thinking not of one man only, but of a group of young retailers, all of whom hold important executive positions. The agricultural industry, which, perhaps more actively than any other, is engaged in reforming its marketing structure, will be glad to learn that constructive thinking is being brought to bear on the problem from the other end of the marketing chain. The first part consists of a sufficiently detailed description of retailing in its many aspects, from the small retail shop to the departmental and the multiple store; and of a more elaborate description of the organization and daily working of a large departmental store. Part II, perhaps the most interesting, is an objective analysis of retailing to-day and of future trends. While defending the retailer against much uninformed criticism, the author himself is a severe critic of the present lack of system. He fully realizes that fundamental re-organization must take place if the producer, the manufacturer and the consumer are to benefit from the increased efficiency of modern methods of production and marketing. He is not afraid to face the prospect of drastic action. His constructive thinking clearly runs parallel to the Agricultural Marketing Act, and he foresees that a marketing board constituted under the Act "could hardly avoid exercising pressure, with a view to the elimination of redundant units in distribution. Indeed, through its control of the key position, so much could be set in motion that a number of major problems which cannot even be tackled in the present ill-regulated state of things could be brought more easily within the realm of practical adjustment. The most important point, however, is that here we have actually erected a new platform, which if properly used can be made to provide a different order of integration between production and marketing. Further, there is implicit in its framework the idea of a collective trusteeship for the successful organization of certain products which are in daily and universal use." He proceeds to hammer his point home by giving figures to show the appalling state of congestion that exists in retail distribution in certain large provincial towns: Liverpool, e.g., with 8.32 houses and 39.7 persons for every shop, and Glasgow, Birmingham and Manchester in much the same state. He concludes by making constructive suggestions for reforming retail distribution in this country. His book should be widely read.

The Nursery (*La Pépinière*). By M. Ebel. Pp. 288 and 100 illustrations. (Paris: Librairie Agricole de la Maison Rustique, 26 Rue Jacob, VIe. 1932. Price 16 fr. 50.)

Professor Ebel has compiled a useful brochure describing methods of propagating fruit and forest trees and ornamental shrubs. The advice given is based on the author's practical experience, and will be found helpful by many horticulturists, nurserymen and others outside his own country. The illustrations are numerous and well chosen.

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NOTES FOR THE MONTH

MAJOR WALTER ELLIOT, the Minister of Agriculture and Fisheries, accompanied by Mr. Malcolm MacDonald, Parliamentary Under-Secretary for the

Home Cheese Dominions, and Major A. J. Muirhead,
Producers M.P., received, on February 14, 1933, a large and fully representative deputation

from home cheese producers. The deputation, which was introduced by Mr. T. Baxter, Chairman of the Milk and Dairy Produce Committee of the National Farmers' Union, comprised 24 representatives from England, Wales and Scotland of producers of all the well-known kinds of cheese.

Speakers, on behalf of the various sections of the deputation, put before the Ministers information with regard to the serious situation of cheese producers throughout the country, caused by the pressure of stocks on the market, a situation which they attributed to a considerable extent to imports from the Dominions. They urged that the Government should give immediate consideration to the possibility of dealing with cheese imports on similar lines to the Meat Import Regulation Scheme.

Mr. Malcolm MacDonald, who spoke first in reply, said that it was interesting and helpful to him to have an opportunity of hearing the home producers' point of view, and that the principle that the home producer had first claim on his own market was one which was cordially recognized not only by the home Government but by the Dominions.

Major Elliot said that he fully appreciated the gravity of the situation in regard not only to cheese but to dairy produce as a whole. Although the difficulties were very real the Government realized the desirability of steadying the milk products situation. The Milk Reorganization Commission in their recently published Report had put forward proposals for a far-reaching scheme for the organization of the milk industry. This would need to be carefully examined, not only by the Government but by the industry itself, with a view to producing not merely negative criticism but constructive, workable proposals.

UNDER the supervision of the Agricultural Meteorological Committee—acting for the Ministry of Agriculture and Fisheries, the Department of Agriculture

Wheat Precision Observations for Scotland and the Meteorological Office —records of meteorological conditions and

of the progress and yields of certain crops are being taken at a number of stations throughout England, Wales and Scotland. For some years past, preliminary tests have been made to ascertain the precision with which, by the sampling method, quantitative data of crop development could be obtained. As a result of the examination of the data thus secured, a scheme of definitive agrometeorological observations on the development of the wheat crop has been put into operation, and records are now being taken at eight selected stations. In each instance observations are made on two standard varieties of wheat, and where possible on a third variety chosen locally for comparison. Records are taken of the dates (1) of appearance above ground ; (2) of tillering ; (3) of emergence of ears ; and (4) when fit for cutting ; together with quantitative observations on the density and growth of the crop.

The table opposite summarizes the first quarter's observations made under the scheme on wheat crops sown last autumn.

The dates of sowing range from October 11 at Woburn to November 25 at Long Sutton, an interval of 45 days ; appearance above ground has a larger range of 61 days from October 22 to December 22, the extremes being recorded at the same two stations. Early sowing is this year associated with quick germination. The interval from sowing to appearance was shortest, 10 days, at Seale Hayne, sown on October 17, and longest, 37 days, at Boghall, sown on November 9.

Appearance above ground based on counts of visible plants on sample areas is recorded somewhat earlier than the visual appearance of rows on the field as a whole. That the precision of the new observations is sufficient to detect varietal differences is strongly suggested by the fact that in five stations out of six Yeoman is up earlier than Square Heads Master, while at the sixth, Sprowston, the difference in favour of Square Heads Master is clearly inappreciable. On the average of six, Yeoman is about 21 hours earlier.

It was expected that the first count, about three weeks after germination, would generally give the highest recorded plant number, and this is certainly true of the early-sown

SAMPLING OBSERVATIONS ON WHEAT, 1932-33, FIRST QUARTER.

Station	Variety	Sowing date	Appearance above ground	Plant density per 32 metres drill		
				First count	Date	Estimated Dec. 31
WOBURN, Bedfordshire	Square Heads					
	Master ..	Oct. 11	} about {	1,874	Nov. 24	1,016
	Yeoman ..	Oct. 11		1,986	Nov. 24	1,154
SEALE HAYNE, Devonshire	Square Heads					
	Master ..	Oct. 17	Oct. 27	1,595	Dec. 5	1,369
	Yeoman ..	Oct. 17	Oct. 26	2,058	Dec. 5	1,363
	Victor ..	Oct. 17	Oct. 30	883	Dec. 5	795
ROTHAMSTED, Hertfordshire	Square Heads					
	Master ..	Oct. 18	Nov. 2	1,581	Dec. 22	1,588
	Yeoman ..	Oct. 18	Nov. 2	1,641	Dec. 22	1,744
	Victor ..	Oct. 18	Nov. 2	1,431	Dec. 22	1,482
WYE, Kent	Square Heads					
	Master ..	Nov. 8	Nov. 28	1,153*	Dec. 14	1,202*
	Yeoman ..	Nov. 8	Nov. 28	1,419*	Dec. 14	1,531*
NEWPORT, Shropshire	Square Heads					
	Master ..	Nov. 9	} about {	728†	Dec. 31	728†
	Yeoman ..	Nov. 9		666†	Dec. 31	666†
BOGHALL, Edinburgh	Square Heads					
	Master ..	Nov. 9	Dec. 16	1,820	Jan. 3	1,820
	Yeoman ..	Nov. 9	Dec. 15	1,828	Jan. 3	1,828
SFROWSTON, Norfolk	Square Heads					
	Master ..	Nov. 11	Dec. 12	1,414	Jan. 4	1,414
	Yeoman ..	Nov. 11	Dec. 13	1,503	Jan. 4	1,503
LONG SUTTON, Hampshire	Square Heads					
	Master ..	Nov. 25	Dec. 22	1,403	Jan. 10	1,403
	Yeoman ..	Nov. 25	Dec. 20	1,825	Jan. 10	1,825
	Wilhelmina ..	Nov. 25	Dec. 22	1,796	Jan. 10	1,796

* Based on samples of three instead of four rows.

† Based on five instead of eight blocks.

stations, Woburn and Seale Hayne. At Rothamsted and Wye a slight subsequent increase is recorded. At the four remaining stations sowing was somewhat late, and no second count was available. In order to obtain comparative plant densities at a fixed date, the numbers at the end of the year, reckoned as December 31.5 or January 0.5, were estimated by interpolation, except for the four later stations, at which the first count gives the best available estimate. The highest density at this date was at Boghall, followed by Long Sutton and Rothamsted, and the lowest, ascribed to attack by rooks, at Newport. Yeoman has a higher plant number than Square Heads Master at six stations out of eight.

From the eight stations as a whole the observations

recorded are satisfactorily complete and comparable ; it is hoped that in the second year all stations will insert a third variety of economic interest for comparison with the standards.

It is intended to publish further data quarterly showing the progress of the crops under observation.

* * * * * *

THE following note has been communicated by the National Institute of Agricultural Botany, Huntingdon Road, Cambridge :—

Sugar-Beet Seed Most farmers now know that there are three main types of sugar-beet seed, the E or heavy-yielding group, the Z or high-sugar-content group, and the N or normal group which falls between the other two. There is no hard-and-fast dividing line between these types, but, broadly speaking, the best-paying varieties in this country belong to the E and N groups. For general cultivation Kleinwanzleben E, Kleinwanzleben N, Dobrovice, Dippe E, Marsters, Johnson's Perfection, Kuhn P, Hoerning H.S., Hoerning R.R., Zapotil I, Zapotil II and Strube E can all be recommended. For early lifting, Marsters is probably the most suitable, with Dobrovice as an alternative. Even under these conditions, however, the other stocks mentioned for general cultivation are likely to give good results. For the earlier sowings, the risk of bolting has to be considered ; on the average Marsters has bolted less than any other variety, and until the last year or two Johnson's Perfection and Kuhn P were nearly as good ; but in a trial, in 1932, all these bolted more than the three Kleinwanzleben strains E, N and Z, against which they were being tested. Nevertheless, no better advice can at present be given than to choose Marsters for the early sowings.

On the richest soils, the tops are apt to grow inconveniently big. In trials carried out in the fens, Marsters, which has the smallest top of the varieties tested, and Kleinwanzleben E have given the best results ; after them come Kleinwanzleben N and Z, and then Johnson's Perfection and Kuhn P. The last two have larger tops than Marsters, but smaller ones than the Kleinwanzleben stocks.

ALL these varieties are primarily of Continental origin and much of the seed used here is grown abroad. Trials have, however, shown that English seed of these varieties, provided it is properly grown and is harvested under good conditions, gives just as good results as foreign-grown seed. Points of

this description and fuller particulars of the leading varieties are dealt with in a leaflet which is obtainable free of charge from County Agricultural Organizers or direct from the National Institute of Agricultural Botany.

* * * * *

THE following note has been communicated by Messrs. W. H. Read and O. B. Orchard of the Experimental and Research Station, Cheshunt :—

Plant Injury A peculiar injury to the foliage of **following the Burn-** Chrysanthemums has been noticed when **ing of Sulphur in** they are grown in glasshouses in which **Vacant Glasshouses** tomatoes and cucumbers have first been raised and in which sulphur has been burnt, after the removal of these crops, to destroy any fungus and insect pests remaining in the houses. The first signs of damage may appear within a few days of introducing the Chrysanthemums into the disinfected houses, a damp or foggy night being followed by the appearance of scorched or withered buds and growing tips.

Dark-brown patches, often accompanied by white deposits around the edges, appear on the upper leaves and petioles of the plants. These patches, which may be quite small or may cover the entire leaf, rapidly shrivel and dry up. Dark-brown sunken areas occur on the sides of the flowering and main stems, which give rise to distorted and curled growth. During the past season, several instances have occurred where the flower buds have been so seriously damaged that the crop has become a complete loss.

It has not been possible to implicate a fungus or bacterial disease or an insect pest as being responsible for this damage ; and recent investigation has shown that, in many cases, it is caused by the presence of zinc sulphate in the drip from the overhead galvanized wires that normally support the tomato or cucumber plants.

During the present season, extensive damage following the burning of sulphur has occurred in houses not fitted with wires, and has been proved to be due to the presence of zinc sulphate in the drippings from the painted surfaces ; the paint in all cases containing zinc oxide as the base. The condensation of moisture in the houses is sufficient to cause a drip from the structure or wires, and zinc sulphate is thus carried in solution to the foliage and buds of the plants.

In one block of houses, erected in March and disinfected by burning sulphur before bringing in chrysanthemums, the

drippings from the painted wood at the period when damage was most pronounced were found to be saturated with zinc sulphate. It was also found that the liquid dripping from the wires of a house recently disinfected by burning sulphur caused the appearance of burnt patches on chrysanthemum leaves in from four to five hours after being placed on the leaves.

Confirmation as to the cause of the damage was obtained by the detection of zinc in the damaged portions of plants sent in for examination, and the production of the same type of injury by splashing chrysanthemum plants with solutions of zinc sulphate. The maximum amount of this chemical tolerated by chrysanthemum plants without noticeable injury was one part of the ordinary crystalline salt in 300 parts of water.

It has been proved that soluble zinc salts result from the combustion of sulphur in houses containing galvanized wire, or painted internally with "zinc-white" paints, by burning sulphur at the rate of 1 lb. per 1,000 cu. ft. in a house in which were placed some galvanized wire and some pieces of board treated with samples of paint suspected of causing "drip" injury. On examination the following morning, it was found that it was possible to dissolve from the paint zinc sulphate at the rate of approximately $\frac{1}{2}$ oz. of the crystalline salt per sq. ft. of painted surface, whilst the wires were covered with crystals of the same substance. The amount of free sulphuric acid in the moisture condensed on the glass was negligible, and very little zinc sulphate was present in the paint or on the wires. The extent of the formation of zinc sulphite by the action of the sulphur dioxide derived from the burning of sulphur and the subsequent oxidation of the sulphite to sulphate may be dependent in some measure upon the amount of moisture in the house during treatment; but, whilst little may be formed under very dry conditions, it is probable that such conditions are not conducive to effective destruction of fungus spores so that treating a very dry house would not have the desired disinfecting action.

An additional test in which flowers of sulphur were dusted on the staging, floor and hot-water pipes in a house in which were placed boards painted with the same paint showed that there is no danger of the formation of sufficient zinc sulphate to cause drip injury when sulphur is used for dusting purposes, i.e., is not burnt. In no circumstances was damage caused by the drip from wood painted with lead paint and exposed to burning sulphur.

Where houses painted internally with paint containing

zinc have been disinfected by burning sulphur, the possibility of subsequent damage can be greatly minimized by thoroughly hosing down with water at frequent intervals. This is most effectively started when the interior of the house is wet, due to condensed moisture which will have dissolved part of the zinc sulphate. Where the trouble is due to the wires only it is advisable to slide these to the bottom of the supporting posts underneath the gutters.

Where conditions are such that hosing down cannot be undertaken, the only remedy is to prevent drip by maintaining a dry atmosphere.

Since the formation of soluble zinc sulphate must cause a partial destruction of the paint, alternative methods of disinfecting the houses should be adopted by using naphthalene or formaldehyde. The use of paint with a lead or barium base would be one means of counteracting the trouble with painted surfaces.

This note has been published because the numerous inquiries received at this Research Station show the injuries from the above cause to be both widespread and numerous.

* * * * *

THE following has been communicated by Mr. R. Boutflour, M.Sc., Principal of the Royal Agricultural College, Cirencester:—

Cramp's Cow Mr. Cramp was a keeper of the House of Correction at Lewes, but he was also the owner of a cow that was, in all probability, the first cow to be officially recorded. The management and the records of the cow were vouched for by the Earl of Chichester and Mr. John Ellman, and for five years the cow's records and management were reported to and published by the Board of Agriculture between 1805 and 1811.

The cow was Sussex bred and was purchased by Mr. Cramp when she was just over six years old. Her record during the next six years was as follows:—

<i>Year</i>	<i>Calved</i>	<i>Dry</i>	<i>Weeks in Milk</i>	<i>Yield in gallons</i>
1805/06	May 1	April 2, 1806	48	1,230
1806/07	April 19	February 27, 1807	45	1,034
1807/08	April 6	April 4, 1808	52	1,445
1808/09	April 23*	February 13, 1809	42	1,055
1809/10	April 3	May 8, 1810	57	1,442
1810/11	May 30	March 20, 1811	42	1,155

* Twins.

Average per year over six years : 1,227 gallons.

Total number of days dry in the six years : 148, i.e., an average dry period of about a month between each lactation.

The records of this cow were published by the Board of

Agriculture eventually, in 1811, in a pamphlet entitled "Hints to Dairy Farmers."* It is a great pity that more notice was not taken of the hints. The following extracts are taken from the introduction :—

The management of cows, recommended and practised by Mr. Cramp, of Lewes, in Sussex, has been attended with such uncommon success, as to justify a more general attention than has hitherto been paid to it; and for the purpose of spreading a knowledge of the practice, it was resolved to print the information transmitted by Mr. Cramp, in such a form as may reasonably be expected to be read by many persons unaccustomed to expensive works.

As the world is apt, when any thing extraordinary comes before it, to doubt the authenticity of facts, it is proper to state the steps that were taken in order to ascertain the accuracy of these Reports.

The world doesn't change!

The Management.—The cow was kept in all the year round in a loose box, and the total area of land occupied by Mr. Cramp was 1 rood 29 poles; this was cropped with lucerne, ryegrass, clovers and carrots. During the summer she was fed daily on :—

$\frac{1}{2}$ bus. of brewers' grains.
 $\frac{1}{2}$ bus. of bran.

together with green food from the small plots.

During the winter, the grains were slightly increased and the bran raised to just over $\frac{1}{2}$ bus. per day; some pollards (amount not stated) and malt dust (2 lb.) were also given.

It will be noted that the bulk of the food is well within the limits of the amount that a cow can efficiently consume.

Bonington Moubray, in discussing this cow's management in his book† on the Management of Milch Cows, Swine, and Bees, states that Mr. Cramp recommended that a cow's stomach should never be overloaded. Her winter ration works out at :—

7 lb. hay.
 28 lb. grains.
 10 lb. bran.
 2 lb. malt dust.
 with some pollards, 3 to 4 lb.,

a balanced ration and about 27 lb. of dry matter per day.

* Cramp, William, *Hints to Dairy Farmers: Being an Account of the Food and Produce of a Cow*. Published by Order of the Board of Agriculture, 1811. The Second Edition, published 1813, had the sub-title: "Being an Account of the Food and Extraordinary Produce of a Cow."

† Bonington Moubray [John Lawrence]. *A Practical Treatise on Breeding, Rearing and Fattening all kinds of Domestic Poultry, Pheasants, Pigeons and Rabbits; also the Management of Swine, Milch Cows and Bees, with Instructions for the Private Brewery on Cider, Perry and British Wine Making*. First Edition, 1813; and subsequent editions in 1816, 1819, 1822, 1824, 1830, 1834 and 1842. The reference will be found in the Eighth Edition, 1842, pp. 271–274.

To this day, brewers' grains are supposed to rot cows ! The following extracts are taken from the report :—

Summer season fed on clover, rye-grass, lucerne, and carrots, three or four times a day, and at noon time about four gallons of grains, and two of bran mixed together ; always observing to give her no more food than she eats up clean. Winter season fed with hay, bran, and grains, mixed as before stated, feeding her often, viz., five or six times a day, as I see proper, giving her food when milking, keeping the manger clean where she is fed with grains ; not to let it get sour ; wash her udder at milking times with cold water, winter and summer. Never tie her up ; lays in or out as she likes ; particularly careful to milk her regularly and clean. Milch cows are often spoiled for want of patience at the latter end of milking them. One man would attend ten cows through the year (with the exception of an assistant at milking times). Feeding milch cows as above stated, they will at all times be in good condition fit for the butcher, if an accident should happen. There will be no ground trampled and food spoiled by cattle running over a vast tract of land. I think cattle may be fattened by the same mode of feeding with much advantage ; one-fourth part of the land would feed them, a great quantity of manure made, and the beast fatten much sooner. Cattle so fed, have nothing to do but fill themselves and lie down to rest. No labouring for their food.

I think cows would nearly double (in the course of the season) their quantity of milk and butter by following the above plan. It is unnecessary for a cow to go dry long before she calves.

Milch cows may be fed with turnips and cabbages, provided proper attention be paid in doing it. One meal a day of turnips or cabbages will not affect the milk, provided care be taken, and not give them any withered or rotten leaves. One rotten turnip or cabbage, would do more injury to milk and butter than a cartload of sweet sound food.

Lucerne should be cut before it grows hard and sticky, or it admits waste, and loses much of its goodness.

Where milch cows are allowed to range abroad for their food, they will never produce that quantity of milk that they will when confined, let their food be ever so plenty ; when they are not hungry, they will be searching after the sweetest spots of herbage, and thereby deprive themselves of rest. Cattle when half fed, will seldom refuse any sort of food, if properly attended ; and no part of this country need be at a loss for provisions to feed them. Where grains and pollard cannot be had, milch cows should have a little nice hay (not heated) once a day, to keep them in proper state, otherwise all green food would make them too loose. Often changing food is good for milch cows. I seldom give my cow two sorts of food following. I cannot be at a loss where there is so great a variety to be had, viz., rye and tares, lucerne, cinquefoil, trefoil, cow grass, clovers, natural grass, green oats, carrots, cabbage, turnips, grains, bran, pollard, hay, etc., etc.

The management of a large dairy (after the plan which I have laid down) may be attended to in most of its rules. Grains seem to be the greatest obstacle. I will suppose they are not to be had at all ; seven months in the year they are not wanted, as every kind of artificial food can be had in great plenty, giving a little sweet hay once a day, to keep them in a regular state. In the winter time there may be provided turnips, cabbages and potatoes ; the two former will no ways affect the milk and butter, if given moderately twice a day ; carefully avoiding giving them rotten

and withered leaves, and giving them plenty of sweet (green saved) hay, they will (no doubt) do much better than ranging abroad in the cold, hungry fields, labouring and fatiguing themselves for food, injuring the land, and thereby occasioning great loss of manure. Thirty acres of land (something more or less : much depends on the quality of the land and management) to produce food enough for 40 dairy cows (if properly managed), including for hay ; where, in the common mode of feeding, twice that number of acres would not do, and they would not produce above half the quantity of milk and butter. I think salting hay, when made into a rick for milch cows, would answer a good purpose. If salt could be had reasonably, about 20 lb. to a ton of hay, shaken regularly over every layer by the makers of the rick, would cause thirst, and thereby increase milk. The quantity of food milch cows will consume, is not easy to ascertain ; they should have sufficient, but not to commit waste. Cattle should not be overfed, so as to be surfeited ; little at a time, and they will eat their food clean. I feed my cow six or seven times a day.

For my part, I require no other proof than what I have experienced, to convince me of the great advantage of feeding cattle after the plan I have laid down. Masters and mistresses who undertake to do their own work, will soon find the advantage arising from this mode of treatment ; and if put into the hands of servants, there is no difficulty whatever, but a simple person may perform, with the attention of their master and mistress in the beginning, to convince them of the truth. There is generally some trouble in forming any new mode that is a public benefit, and likewise in laying aside an old one, let it be ever so bad.

Cramp knew the value of young green hay. He knew that hay should not be heated. He knew that, to get a lot of milk, he had to feed a lot of nutrients. He knew that a cow should not be overfed.

In fact, there is very little any of us could have taught Mr. Cramp in the procuring of high yields, yet his valuable findings have remained unheeded by practical men for a hundred years !

* * * * *

THE following note has been communicated by Dr. Charles Crowther, Principal of the Harper Adams Agricultural College, Newport, Shropshire :—

Power Farming Course In view of the widespread and increasing interest of all types of farmer in the application of modern machinery in agriculture, the authorities of Harper Adams Agricultural College felt that a useful purpose might be served by the provision of a short course of special lectures and practical instruction in mechanical methods for farmers and others seeking guidance in the newer developments. By way of experiment, a week's special Power Farming Course was, therefore, arranged and held in the week commencing

January 2, 1933. The course was undoubtedly experimental, there having been nothing of a similar nature previously undertaken—at any rate in this country.

The services of a number of external lecturers were enlisted, each a specialist on the subject with which he was asked to deal. Each lecturer spoke for an hour, after which open discussion took place for upwards of half-an-hour. In view of the novel character of the course the time-table is here given *in extenso* :—

Mon.	9.30–10.55	11.5–12.30	2.0–4.30	6.0–7.30
Jan. 2	Internal Combustion Engine for Farm Purposes : Mr. D. N. McHardy	Mole Draining : Mr. F. Blackaby	Demonstra- tions	The Tractor in Service : Mr. D. N. McHardy
Tues. Jan. 3	The Milking Machine : Mr. J. E. Newman	Open Air Dairying : Mr. A. J. Hosier	Demonstra- tions	Electricity in Agri- culture : Mr. F. E. Rowlands
Wed. Jan. 4	Demonstra- tions	Mechanized Cereal Growing : Messrs. Alley Bros.	Demonstra- tions	Machinery in Mixed Farming and Market Gardening : Mr. D. R. Bomford
Thurs. Jan. 5	Agricultural Transport Vehicles : Mr. D. N. McHardy	Demonstra- tions	Demonstra- tions	Lubrication of Farm Machinery : Mr. E. F. Hughes
Fri. Jan. 6	Rotary Tillage : Mr. Schofield	Electricity Generation and Supply : Mr. A. R. Mitchell	Power Farming Films	Electric Motors and Lighting : Mr. A. R. Mitchell

The whole of the arrangements were made by Mr. D. N. McHardy, N.D.A., A.I.A.E., the College Lecturer in Agricultural Engineering, who also gave three of the lectures and organized the demonstrational work. All the other lecturers came from outside, including two (Messrs. Newman and Blackaby) who were provided by the Oxford Institute for Research in Agricultural Engineering.

For the purposes of practical instruction, special exhibits were sent by a number of manufacturers, to whose willing co-operation much of the success of the course was due. These exhibits included a Fordson tractor; International 10-20 tractor and power mower; Marshall tractor, Massey-Harris

four-wheel-drive and Roadless tractors and power binder ; Lister-Diesel engine, Bamford-Diesel engine, etc. ; Ransomes' plough and cultivator ; Wilder pitch pole harrow ; Aitken-head renewable tined harrow ; Hosier ear hay sweep ; and Transplanters (Holding) Co., Ltd., planting machine. In addition, a comprehensive working electrical exhibit was staged by the General Electric Company.

A feature of the practical side was that each manufacturer sent a technical representative who took the classes through the entire construction and operation of each machine and in some cases gave driving lessons. This instruction, apart from driving, was all given under cover, it being considered that the limited time available would be better devoted to detailed examination of the machines rather than to field demonstrations.

For practical work, the exhibits were grouped in six divisions, to be visited in six periods in rotation by a like number of small groups into which members of the course were divided.

The various aspects of field work throughout the whole year were illustrated by the free use of lantern slides and by a cinematograph show. To the latter, various firms contributed films, and the programme, lasting about three hours, included Tractor Building and Combine Harvesting (International Harvester Co.) ; Power Farming by Fordson ; Wheat Growing and Potato Culture with Caterpillar Tractors ; the Gyrotiller in the West Indies (Messrs. Fowler & Co., Leeds, Ltd.) ; and one of the Rototiller. Both lantern slides and films enabled operations to be shown that obviously could not have been carried out in the field at this season of the year.

The course was attended by over 30 members from all parts of England, Wales and Scotland, while in addition about a dozen of the internal students of the College came back from vacation to join. The manufacturers' representatives were regular members of the audience, when not otherwise engaged, so that both users and makers were able to take part in the discussions.

Not the least valuable aspect of the course was the opportunity created for all parties to come together and discuss one another's problems. In fact, such discussion appeared to be continuous from morning till night right through the week, and, at the end, there was a general request that the course should be repeated next year.

* * * * *

THIS Society, which was founded by Max Guntz in 1904, has for its objects the collection and distribution of information regarding agricultural literature, the stimulation of interest and research in the history of agriculture, and the collection of materials for the purpose. Its activities cover the widest possible field, surveying the development of agriculture in all countries, as well as in the smaller areas of provinces and districts. It is not only concerned with general questions such as arise out of the wider aspects of the subject, but also with the history of the individuals and families who have been noteworthy in aiding the progress of the industry.

**The German
Agricultural
History and
Literature
Society**

It publishes a quarterly journal known as the *Jahrbuch der Gesellschaft für Geschichte und Literatur der Landwirtschaft*. The contents of the volume for 1932 include three contributions relating to individuals, as well as articles on the "Swiss Peasant Association," the "Development of Agriculture in the Graeco-Roman Civilization," "The Use of Marl in Ancient Times," and finally an article dealing with a "Few of the Measures devoted to the Development of Agriculture in China under the Mongols." This brief outline of the contents of the yearbook is a sufficient indication of the breadth of its outlook and the comprehensive nature of its interests. The Society has at present a comparatively small membership, and is willing to welcome into its ranks all who are interested. The annual subscription, which includes free copies of the yearbook, is 4 RM. per annum for people outside Germany. Full information regarding the Society and its activities can be obtained from Professor Dr. W. Seedorf, Institut für Landwirtschaftliche Betriebs und Landarbeitslehre, Gosslerstrasse 16, Göttingen, Germany.

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THE following note has been communicated by Mr. W. T. Price, M.C., N.D.A., N.D.D., Organizer of Agricultural Education in Wiltshire, and Mr. T. C. Goddard, B.Sc., N.D.D., Assistant Organizer for Dairy Husbandry:—

**A Wiltshire
Pig-feeding
Experiment**

The experiment here described was carried out to ascertain the effect of different methods of feeding pigs, viz. :—

- (1) Pigs fed outdoors on dry food.
- (2) Pigs fed outdoors on wet food.
- (3) Pigs fed indoors on dry food.
- (4) Pigs fed indoors on wet food.

The pigs chosen for this purpose were the selected progeny of four Wessex Saddleback sows mated with a pedigree Large White Yorkshire boar.

All pigs were weighed and made up into four pens containing 5 pigs each. These pigs were so arranged that each pen weighed approximately the same, and the sexes were distributed as evenly as possible. All the pigs were ear-clipped for identification purposes. The outdoor pigs fed on wet food had access to a small paddock, and had a movable hut. The outdoor dry-fed pigs had the run of a small copse. All the pigs were fed twice a day.

The pigs were born on May 15 to 19, weaned on July 8, and killed on November 28. They were weighed at intervals during the period, the weights at different dates being as follows :—

Pen	July 1	Aug. 15	Sept. 16	Oct. 14	Nov. 18	Nov. 28
	lb.	lb.	lb.	lb.	lb.	lb.
Outdoor dry	121½	341	552½	792	992	1,047
Outdoor wet	118½	350	607	819	1,001	1,055
Indoor dry	121	368	596	821	991	1,040
Indoor wet	120	352½	592½	772	967	1,005

INCREASE IN LB. LIVE WEIGHT PER PEN PER DAY

Pen	Period (days)					Average gain per pen per day in lb.
	45-90	91-122	123-150	151-185	186-195	
Outdoor dry	4.87	6.6	8.5	5.7	5.5	6.23
Outdoor wet	5.14	8.0	7.57	6.3	5.4	6.48
Indoor dry	5.49	7.0	8.0	4.85	5.1	6.09
Indoor wet	5.16	7.5	6.4	5.56	3.8	5.68
Average gain per period	5.16	7.3	7.62	5.60	4.95	6.12

TOTAL FOOD CONSUMED PER HEAD PER DAY

Pen	Sex		Food	Av. Carcass Weight	Ratio of Live Weight to Food
	Sows	Hogs			
Outdoor dry	3	2	620 lb.	159	1 : 3.9
Outdoor wet	2	3	647 lb.	164.4	1 : 3.9
Indoor dry	3	2	666 lb.	161	1 : 4.1
Indoor wet	3	2	651 lb.	154	1 : 4.2

The pigs were fed by Mr. O. M. Peall, Oare Pennings, Marlborough, on the following mixtures :—

(1) For the five weeks after weaning :—

1 cwt. Extracted Soya bean meal.	5 cwt. Maize meal.
1 cwt. Fish meal (best white).	8 cwt. Barley meal.
5 cwt. Sharps.	

Minerals added : 15 lb. ground chalk and 6 lb. salt per ton of foodstuff.

(2) Until the end of the fattening period :—

- 8 parts by weight Barley meal.
- 5 parts by weight Tapioca meal.
- 6 parts by weight Sharps.
- 1 part by weight Decorticated ground nut cake.

Chalk and salt were added to the ration. At the end of the fattening period, the pigs were fasted for twelve hours and then slaughtered at Messrs. Bowyers' Wiltshire Bacon Factory, where they were graded according to the schedule laid down by the Pig Council.

The grading was as follows :—

Outdoor dry-fed	40 per cent.	} Classified as Prime Wiltshire Baconers.
Outdoor wet-fed	80 per cent.	
Indoor dry-fed	40 per cent.	
Indoor wet-fed	60 per cent.	

The failures were due to a slight excess of shoulder fat.

For prime baconers the measurements must be as follows :—

Weight between seven and nine score. Length not less than 29 in. (front of pelvis bone to front of first rib). Shoulder fat $1\frac{1}{4}$ –2 in. Loin fat $\frac{3}{4}$ –1 $\frac{1}{2}$ in. Belly or Streak not less than 1 $\frac{1}{4}$ in.

The manager of the factory, Mr. H. J. Spackman, made the following comments :—

- A. *Alive* :
- (1) The hair was fine and silky.
 - (2) The pigs were well proportioned with exceptional underlines.
 - (3) The pigs had good hams.
 - (4) The shoulders were of the desirable lightness.

B. *Dead* : The carcasses were carefully examined after slaughter and revealed the following :—

- (1) The proportion of lean to fat was excellent.
- (2) In all cases they were of good length.
- (3) The backs were long and lean, which satisfies the present-day requirements.
- (4) The streaks in all cases were very good, which is an important point, as thick streaks are demanded by the bacon trade.
- (5) The hams were exceptionally good, well fleshed to the hock and full of lean meat, another important trade requirement.
- (6) The shoulders were mostly on the light side, which is also important.
- (7) The fat was firm and free from oiliness.
- (8) The skin or rind was particularly fine, showing no signs of coarseness.
- (9) The ratio of heads to carcass weight was favourable.
- (10) The texture of the lean meat was good.
- (11) These pigs showed no seedy cut owing to the fact that they were the progeny of a pedigree Large White boar.

General observation : A very choice lot of pigs.

also been recorded from America,² and, as shown in this article, its presence in the British Isles has now been determined, as a result of studies made at Cambridge. A good description of Spotted Wilt, as it occurs in Australia, has been published by Samuel, Bald and Pittman,⁴ and the writer has published a detailed account of the disease based on material collected in England and Wales.⁷

Symptoms of Spotted Wilt.—The following is a description of the chief symptoms of Spotted Wilt of the tomato as observed in this country. The initial signs of the disease appear as a slight intensification or thickening of the veins of the younger leaves, and this is sometimes accompanied by the appearance of one or two yellowish concentric rings in the leaf tissue. At about the same time, the young leaves exhibit a tendency to curl downwards and inwards. The next symptom is the appearance on the leaves of numerous bronze-coloured markings that may be either irregular or circular in form; this bronzing is the most characteristic of all the signs of Spotted Wilt on an infected tomato plant (see coloured plate). At this stage, growth of the plant is arrested and it sometimes succumbs to a severe and general die-back or necrosis, resembling one form of Streak disease in potatoes. As a rule, however, the plant is not completely killed. At a later stage of the disease, the symptoms take the form of a fairly bold yellowish mottling of the leaves, together with some leaf distortion. As regards the effect of the virus on the fruits, these may occasionally show pale rings or ring-like marks, or exhibit a "froth" or "lace" effect on the surface. On the other hand, the writer has observed plants seriously affected with Spotted Wilt giving rise to fruits which, though few in number and poor in quality, were otherwise apparently normal. It has been found from experiments with this virus upon plant hosts other than the tomato that the predominant tendency of the symptoms is towards the formation of concentric rings.^{5 & 7}

Methods of Spread of Spotted Wilt.—As mentioned in the opening paragraph, virus diseases are infectious, and this holds good for the viruses affecting plants as well as for those that attack animals. Some plant viruses, such as that causing Tobacco Mosaic, are easily spread from diseased to healthy plants by the touch of a contaminated hand or knife, and this may also be true with Spotted Wilt in relation to the operation of "stopping." The operator may thus spread the



Spotted Wilt Disease of the Tomato showing the secondary symptom
of bronze coloured markings on the leaves

virus from diseased tomato plants to healthy ones. This, however, is not the chief or the most important method of distribution of the Spotted Wilt virus. Most plant viruses are dependent for their dissemination from plant to plant upon certain insects that feed upon those plants, and Spotted Wilt is no exception to this rule. What, then, is the insect which is concerned in spreading this disease, or, in other words, what is the insect vector? Experiments carried out first in Australia⁴ and later at Cambridge⁶ have shown that the vector of Spotted Wilt is a very small insect known as a Thrips, the species concerned in this country being that known as *Thrips tabaci* Lind. (Fig. 1). This Thrips is a very minute insect. It is present in 90 per cent. of the glasshouses of this country, and it lives and reproduces itself upon a great variety of glasshouse plants. The insects feed upon an affected tomato plant and then migrate to neighbouring healthy plants, and in feeding upon them inoculate them with the virus of Spotted Wilt. *Thrips tabaci* is an active and freely moving creature, and, if present in sufficient numbers, soon spreads the disease right through a glasshouse.

Samuel and Bald³ have shown with another kind of Thrips (*Frankliniella insularis*)—and the writer has confirmed the observations with *Thrips tabaci*—that, in order to become infective, the Thrips must feed *in its young or larval stage* on an infected plant; when adult, the insect appears to be unable to pick up the virus afresh. Why this should be so is not yet clear; it may be due to certain known differences that exist in the structure of the gullet of the larva and the adult respectively, or it may be connected with an “incubation period” of the virus in the insect’s body and the length of the adult life. Whatever the reason, the circumstance does not interfere with the extreme efficiency with which the Thrips transmits the virus. Some 10 to 20 days after the first feeding upon a healthy tomato plant by an infective Thrips the primary symptoms of the disease develop, often in close proximity to the feeding marks made by the insect. These feeding marks are very characteristic, and serve to indicate to the tomato grower the presence of the insect in his glasshouse. They take the form of silvery white patches on the leaves, accompanied by numbers of minute excretory granules.

It may not be out of place here to give a brief description of *Thrips tabaci*. In its young stages, the insect is pale yellow in colour, wingless and actively motile. It is long and narrow, measuring from about $\frac{1}{16}$ in. in its youngest stage to $\frac{1}{8}$ in.

in its adult form. It will thus be realized that the insect is very small. The mature insect differs from the preceding stages in being light-grey or brownish in colour, and in possessing two pairs of very narrow-fringed wings, by means of which it progresses in short, hopping flights.

Host Range of the Spotted Wilt Virus.—Some plant viruses appear to be restricted in their spread to one or two particular plant groups, as, for instance, the potato viruses, which do not attack many plants outside the family *Solanaceae*. Certain other viruses, however, have a very wide host range and are capable of affecting plants quite diverse in character, and belonging to different families. A virus of this type is that which causes "Aster Yellows," a disease not yet known in this country, but which has been experimentally transmitted abroad to 170 different species of host plants. While it cannot be claimed that the tomato Spotted Wilt virus has so wide a host range as that of Aster Yellows, yet the writer has transmitted this virus, either by means of the Thrips or by needle inoculation, to a number of very different host plants. About twenty members of the *Solanaceae*, other than the tomato, have successfully been infected with the virus of Spotted Wilt; these include the potato, tobacco, thorn-apple (*Datura*), henbane, black nightshade, woody nightshade, deadly nightshade and *Solanum capsicastrum*. Then, as regards host plants other than the *Solanaceae*, it sometimes happens that Dahlias that have been grown in the same glasshouse as tomatoes develop a curious disease that expresses itself in the form of pale concentric circles on the leaves. Experiments at Cambridge have shown this Dahlia disease to be due to the same virus as that which causes Spotted Wilt in the tomato. The writer has also transmitted the virus to other members of the Dahlia family (*Compositae*), as, for example, to Asters, in which the symptoms appear in the form of dark and light green mottling, and to Zinnias, in which the symptoms may assume the form either of rings or mottling. Again, it has been found possible to infect some members of the family *Leguminosae*, and the virus has been experimentally transmitted to Lupins, which also develop concentric circles on the leaves, as well as to the broad bean (*Vicia faba*). On the last-named, the virus produces a fatal disease which first shows itself in the form of zoned lesions on the leaves, these being followed by severe necrotic lesions or "stripes" on the stem (Fig. 2). The common broad-leaved plantain (*Plantago major*) has been infected with the Spotted Wilt virus, and here the disease expresses itself



FIG. 1. *Trips tabaci* (Fenl.) the insect vector of the virus which causes Spotted Wilt of tomatoes. Adult female ($\times 140$).

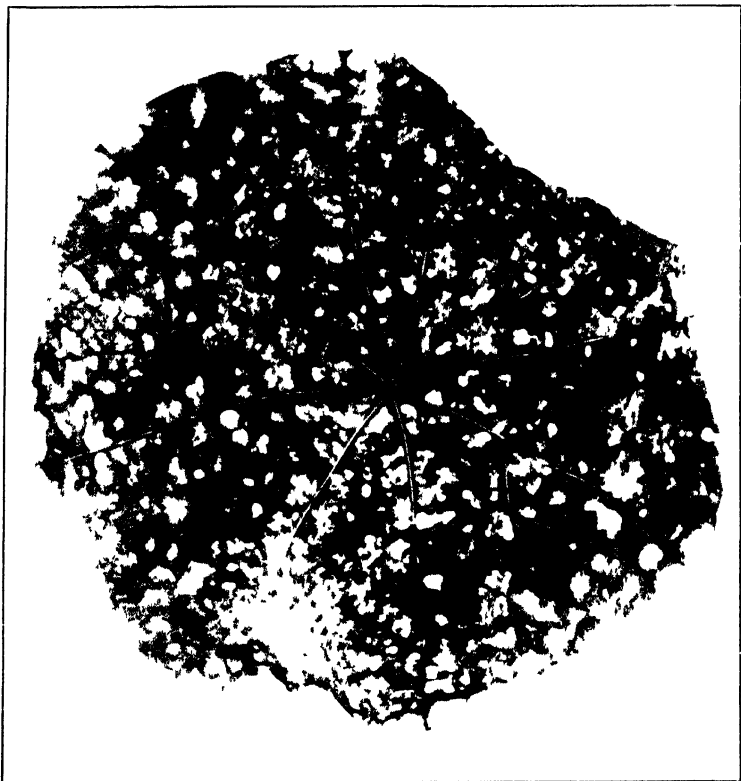


FIG. 1.—Leaf of *Nicotiana glauca* affected with the tobacco etch virus. Note the characteristic lesions.

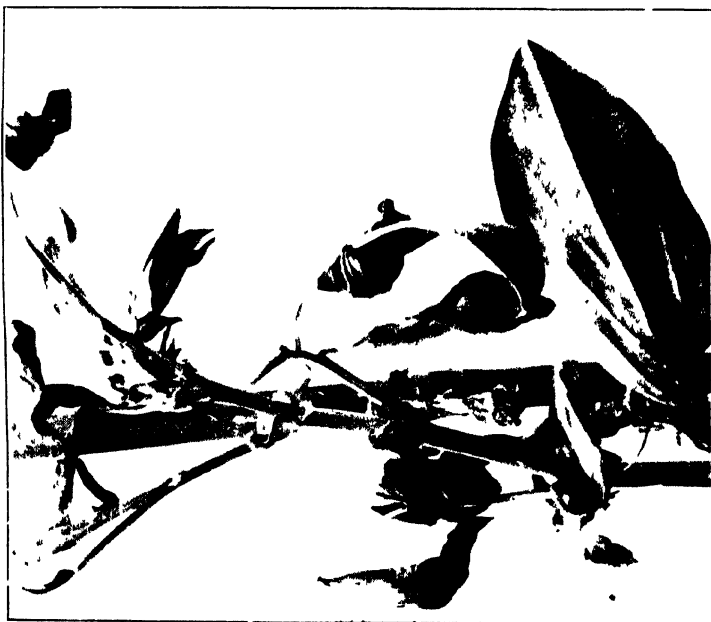


FIG. 2.—The broad bean (*Vicia faba*) killed by the virus of tobacco etch. At the base of the plant note the characteristic thickening and distortion.

in the form of zoned lesions rather than as pale rings or concentric circles. Another susceptible plant, sometimes grown along with tomatoes in the same glasshouse, is the Nasturtium (*Tropaeolum*), and the writer has known the double form of this plant, grown year by year from cuttings, to act as a continual source of infection for tomatoes (Fig. 3). All this is sufficient proof that the Spotted Wilt virus is capable of infecting many different plant hosts in addition to the tomato, and the importance of this fact will be indicated in the succeeding paragraph.

Economic Importance of Spotted Wilt.—The economic significance of the Spotted Wilt virus lies mainly in its connexion with the tomato plant, and, in the writer's opinion, this virus is the cause of serious loss to the tomato-growing industry. At the moment it is probably not fully realized how serious this loss is, because the damage really due to Spotted Wilt has, it is believed, often been attributed to other causes. Although the writer's previously published statements^{5 & 6} were the first records of the disease in the British Isles, there can be little doubt that the virus has been present in this country for some years and that the disease caused by it in tomatoes has been confused with Mosaic and Stripe. The chief reasons for considering that Spotted Wilt is, or soon will be, of serious economic importance to the British tomato industry lies in the fact that the insect vector of the virus is present, as already stated, in the great majority of glasshouses, and it is capable of feeding and reproducing itself on a variety of different host plants. It is also rather a difficult insect to control, and, owing to its minute size, it is frequently overlooked. Another important point in this connexion is the wide host range of the virus; this property enables the virus to persist in glasshouses on a variety of plants, and, aided by the omnivorous habit of the Thrips, infection of the new season's crop of tomatoes is an easy matter. A plant that probably plays an important part in the overwintering of the Spotted Wilt virus is *Solanum capsicastrum*, which is largely grown for table decoration. It was in this plant that the virus was first discovered in this country in 1929.⁵ Tomato plants infected with Spotted Wilt have been received at Cambridge from all over the country, so that there is little doubt that the disease is widely spread in Great Britain. There is also some evidence that the virus is present in Ireland.

Preventive and Remedial Measures.—The control of tomato Spotted Wilt resolves itself very largely into the entomological question of the control of the insect *Thrips tabaci*; if this insect is absent, the disease is unlikely to spread, to any great extent, though the possibility of some local spread by the hands or knife of the worker still remains. The destruction of the Thrips in glasshouses is not a very easy matter, but the insect can be kept down by careful spraying and fumigation. As a spray, Speyer⁸ recommends a paraffin-nicotine emulsion, made up as follows :—

Paraffin emulsion	..	..	..	1 pt.
Water	..	..	..	10 gal.
Commercial nicotine	..	..	..	2 fluid oz.

This spray is not suitable for dealing with attacks by Thrips upon flowers. For fumigation, nicotine at the rate of $\frac{1}{2}$ fluid ounce per 1,000 cub. ft. of space may be used; a simple method of fumigation is to vaporize the nicotine in a metal saucer on a tripod over a small spirit lamp. For dealing with infestations of Thrips upon flowers, such as Cyclamen or Arums, Speyer recommends naphthalene, grade 16, broadcast over the plants at the rate of 10 oz. per 1,000 cub. ft. of space.

Another point to be borne in mind, and already dealt with above, is the susceptibility of certain other plants, frequently grown in glasshouses along with tomatoes, to the virus of Spotted Wilt. Such plants may serve as sources of infection and may also enable the virus to persist from season to season. The following plants in particular are all susceptible to this virus and should not be grown in proximity to tomatoes in areas where Spotted Wilt is present :—

- Solanaceae* : Potatoes.
Solanum capsicastrum, Orange flower.
Solanum melongena, Egg plant.
Streptosolen Jamesonii.
Browallia speciosa-major.
- Leguminosae* : Lupins and Broad beans.
- Compositae* : Dahlias, Asters and Zinnias.
- Campanulaceae* : *Trachelium* spp., *Campanula pyramidalis*.
- Tropaeolaceae* : Double Nasturtium.

It should also be remembered that certain weeds such as the common broad-leaved plantain are capable of harbouring the virus.

The virus of Spotted Wilt does not yet appear to be established out-of-doors in the British Isles, but it is probably only a question of time before this will occur. In Australia, the disease is common in tomatoes grown out-of-doors. Infected Dahlias, Asters and other plants are frequently

planted in the open, and transmission of the virus from these to potatoes, plantains, lupins, or broad beans can thus easily be accomplished. The fact that the Spotted Wilt virus apparently does not easily survive the winter in the resting tuber may prevent the disease from becoming established in the potato crops of Great Britain, and from thus adding one more to the long list of virus diseases to which this plant is subject.

As regards the possibility of the transmission of the disease in tomatoes by seed from affected plants, experiments so far carried out at Cambridge indicate that the virus is not seed-borne. It would, however, be unwise to save seed from tomato plants affected with Spotted Wilt.

The writer is indebted to Mr. J. P. Doncaster for taking the photographs illustrating this article and for making the coloured drawing.

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THE WORKING OF THE SEEDS ACT, 1920, IN THE SEASON 1931-32

JUDGED by statistics alone, the year's operations under the Seeds Act, 1920, show results that may seem a little disappointing. The number of samples which, on being check tested, revealed discrepancies in the particulars declared on the sale of the seed was slightly greater than that for either of the two previous seasons. A closer examination of the situation, however, indicates that these results do not afford evidence of any falling away, on the part of the seed trade, from the satisfactory standard previously attained. In fact, if due allowance is made for factors that tend to mask the true position, it may be claimed that the steady progress of the last few years has been well maintained.

The most notable feature of the past season was the difficulty experienced with samples of English clover seed, particularly with red clover, in consequence of the wet and cold weather conditions under which this seed was harvested. Seed from most parts of the country was affected ; and it was common experience that, as the seed dried out, there was a heavy fall in germination, accompanied by an increase in the number of hard seeds. It followed that discrepancies between the declared particulars of germination and the results obtained in check tests at the Official Station were frequent and often very marked. It will be obvious that these abnormalities are of little significance in assessing the condition of the seed trade of the country.

The figures for samples of packeted seeds, also, while closely corresponding with those for 1930-31, are inclined to give a worse picture of this section of the trade than is warranted. For some years past the packet trade has tended to become more and more concentrated in the hands of a small number of leading firms, who have set up agencies in almost every town and village. The agents are supplied with packets on the " sale or return " system ; and, provided these agents remember to return their unsold stock at the end of each season, there is little likelihood that they will come into conflict with the requirements of the Act. The large wholesale firms that put up the packets conduct their business efficiently, and supervision is relatively a simple matter.

Not all of the trade in packeted seeds, however, can be watched through the large firms that form the main channels of distribution. A number of smaller wholesale firms sell the packets outright to retailers. With this system there is a

temptation for the retailers to hold over their stocks from year to year and to offer them for sale without re-testing; and a certain amount of inspection and sampling is necessary to check this practice. The activities of Inspectors, therefore, are largely directed to the smaller but more troublesome portion of the trade; and it follows that, if the results of control sampling only are considered, the impression of the quality of packeted seeds, as a whole, will be less favourable than is justified.

In this annual survey of the administration of the Seeds Act, it is worth while to emphasize that the principle of the Act is not to demand that sellers shall offer seeds attaining to particular standards: it is, rather, to require that certain essential facts concerning the seeds offered shall be declared to the purchaser, penalties being enforceable for failure to declare the required particulars, and for making false statements. Seed of low quality may still be offered for sale; but the important provision is that the purchaser must be supplied, in writing, with those particulars—such as percentages of purity and germination—that will enable him to form a very fair estimate of the probable value, for the purpose in hand, of the goods purchased.

From the standpoint of the reputable seedsman, also, the Act has conferred many advantages, not the least of which is the virtual elimination of competitors whose undercutting methods were based largely upon misrepresentation. Another material gain to the merchant is that, since the Act affords a buyer the right to receive a statement of particulars, and provides him with a method of getting this statement checked cheaply and impartially, it goes far towards relieving sellers of the difficulty and dissatisfaction that must arise out of trying to deal with claims that are really due to weather and cultural conditions and not to any known defect in the seeds themselves. It is believed that the trade would not willingly go back to the uncontrolled conditions of pre-war days.

Licensed Seed-Testing Stations.—In addition to the Official Seed-Testing Stations set up under the Act, a number of Private Stations are licensed by the Minister to test seed, but only for the purposes of the licencees' own purchases and sales. Until the end of 1931 there was one Private Station that had been dealt with exceptionally. Mr. D. Finlayson, of Wood Green, London, who for many years before the passing of the Act had conducted a commercial seed-testing station, was allowed, under special licence, to continue his business.

The results of his tests were eligible for declarations made under the Act. Mr. Finlayson has closed down his Station ; and thus all firms, except those holding a licence to test for themselves, have now to send the seeds they require to be tested to an Official Station. There are 80 Private Stations in operation ; 30 are licensed to test all kinds of seed covered by the Act, while 28 are restricted to the testing of cereals only. The licences of the remainder are limited in their scope somewhere between these two extremes.

Taken as a whole, the firms possessing Private Licensed Stations form a highly important section of the seed trade of the country, for a very large proportion of the seed used by agriculturists passes through their hands. It naturally follows that the operations of these stations are of great concern in the administration of the Act. A duplicate, or "reserved," portion of each sample of seed tested is retained by the stations ; and, in addition to other methods of control, Inspectors periodically select a number of "reserved portions" from each station for check-testing at the Official Station. Explanations of discrepancies of any importance are called for, and continual efforts are made to secure uniform methods and results. Over 1,500 "reserved portions" were selected for check-testing during the season, 470 being of grasses and clovers, 265 of field seeds, 392 of garden seeds, and 381 of cereals, with also a few of sugar-beet seed. The number of discrepancies to which it was necessary to call attention was slightly smaller than that for the previous season. Their character suggests that the work of the stations is carried out in a very satisfactory manner.

Occasional difficulty is still encountered through the use of non-standard methods of testing ; but, with the good will that exists between the Private Seed-Testing Stations and the Official Station, uniformity in methods—and consequently in results—is gradually being attained. To this end a series of "Referee Samples," all drawn from uniform bulks, is sent out once or twice each season for testing by the Private Stations. The results are, later, circulated for comparison with those obtained for similar samples tested at the Official Stations of the United Kingdom. Two such series were circulated during the season under review.

Visits to Seedsmen.—With the Act working satisfactorily, and in view of the pressing need for economy in Government expenditure, a reduction in the number of visits to sellers was decided upon for the season. The total reached was a

little over 4,500, compared with nearly 6,000 in 1930-31; and these included 777 calls on firms not previously visited. The effect of any diminution of activities naturally requires careful watching; but the experience of the season is to indicate that it has not resulted in any slackening on the part of the trade. The fact is, no doubt, that most seedsmen have come to treat the statutory requirements as but natural and proper, and to shape their business behaviour to the Act.

As a result of special sampling, it was found that certain sellers were making declarations in regard to mixtures of seeds by reference to their catalogues, but that in practice it would have been difficult, if not impossible, to ascertain the figures for the respective components of the mixtures by means of the information given in the catalogue. The matter was taken up with the firms in question.

A number of samples of clover seed, described as "English," were drawn during the season for special examination, with an eye to the country of origin. The samples were selected on account of their suspicious appearance. On detailed examination, one or two of them had to be classed as "doubtful"; but most were almost certainly of English origin, and in no instance was it possible to say definitely that the seed was foreign. The suggestion, which is made from time to time, that all imported clover seed should be stained for identification purposes has received very little support from this inquiry.

Visits to Farmers.—Efforts have been made, again, during the period under review, towards ensuring that farmers should realize their rights as buyers and should also observe the Regulations when acting as sellers. In all, 1,020 farmers were called upon—generally in connexion with other matters as well as seeds—including 518 not previously visited. These are, of course, in addition to those interviewed at agricultural shows, at markets, in auction rooms, and at other meeting-places. Some Inspectors were able to arrange to give talks on the Act to groups of farmers at local centres. While there is still room for improvement, it may be said that farmers generally, especially the younger generation, are becoming more familiar with their duties when selling seed, as well as with their rights when buying. Each year sees an addition to the list of farmers making use of the Official Seed Testing Station.

It is a pleasure to record the valuable work done by members of some of the County Agricultural Education Staffs

and certain of the branches of the National Farmers' Union in making the provisions of the Act better known. Most effective propaganda can be secured by means of suitable references in lectures, during talks at the shows and in the day-to-day course of business. It is earnestly hoped that this form of publicity will be continued and extended.

During the season a few Inspectors sought permission from farmers to draw samples from parcels of seeds as they had been received at the farm. The object was to ascertain whether the particulars required by the Act were, in fact, delivered to the purchasers, and whether they were given correctly. While the number of these samples was too small for any great significance to be attached to the findings, some useful information was obtained. As far as it is safe to generalize, it would appear that, where there is non-compliance, it is more a matter of inadequate clerical arrangements on the part of suppliers than of failure to provide the quality of seeds ordered. Some merchants are, apparently, in the habit of delaying the delivery of the written statement during the rush of the season, and in one or two cases it has been necessary to point out that this is contrary to the Act.

Control Sampling.—A total of 1,337 samples was taken during the year to check particulars declared on the sale of seeds, the numbers for the different kinds of seeds being : grasses, 149 ; clovers, 384 ; field seeds, 106 ; " loose " garden seeds, 314 ; cereals, 68 ; sugar-beet, 69 ; and packeted seeds, 247. The peculiar difficulties encountered with English clover seed have already been mentioned ; and, of the 384 samples of all kinds of clover seeds taken, no fewer than 62 (or 16 per cent.) showed discrepancies in purity or germination. Nearly 90 per cent. of these, however, were found in English seed that had lost in germinating power or suffered an increase in " hard " seeds. Apart from packeted seed and the clovers already mentioned, 706 samples were taken, of which 27 (or 4 per cent.) showed discrepancies in either germination or purity—25 in germination and 2 in purity.

Looking again at non-packeted seeds as a whole, there were 28 instances where it was necessary to call attention to matters other than purity or germination discrepancies. Four were concerned with omission to state that dodder was present ; 8 with omission of the country of origin of the seed ; and 1 with bushel weight. In 10 cases the statement was incomplete in some other respect, or was either invalid or omitted altogether. Three seedsmen, or their agents, declined to sign

the particulars declared ; and in two cases the seeds had not been tested.

Four of the germination discrepancies were within 10 per cent. of the declared figure, 4 showed differences of more than 10 per cent., but less than 15 per cent., and 17 exceeded 15 per cent. Of the 10 purity discrepancies (including those relating to clovers), 4 were of less than 3 per cent., 3 lay between 3 and 5 per cent., and 3 were greater than 5 per cent. To summarize the position, some 10·5 per cent. of the non-packeted samples called for special attention—5 per cent. on account of germination discrepancies in clovers, 2 per cent. because of germination differences in other seeds, 1 per cent. in relation to purity, and 2·5 per cent. in connexion with omissions from declarations and other similar matters.

The total number of "packet" samples was 247, of which 15 disclosed discrepancies in germination and 1 in purity, making a total of 6 per cent. There were also 8 instances of invalid or incomplete declarations. Most of the germination discrepancies were due to seed having been held over from the previous season.

Seed Potatoes.—The larger seed potato merchants, handling the bulk of the trade, are well acquainted with the legal requirements, and are generally observant of the provisions of the Act. There are, however, considerable numbers of small traders—e.g., greengrocers and small growers—who, according to the state of the market, occasionally break into the seed potato trade during the short selling-season. Some are still ignorant of the requirements of the Act ; and to trace them and bring them to a realization of their responsibilities is a long and difficult task. Two other classes of sales continue to present some difficulty : local seed potato auctions are not always conducted with strict observance of the law ; and there is little doubt that sales of seed potatoes between farmer and farmer still take place without proper regard for the Act.

The shortage of supplies and consequent high prices at the beginning of the season brought on to the market many lots of potatoes that would not otherwise have found their way there as "seed." One effect was, of course, to accentuate the normal difficulties of enforcement. For one thing, many of the sellers of these lots had not had previous experience of selling seed potatoes ; and for another, the demand for seed was, for a time, so heavy that almost anything in the way of potatoes was saleable. A special effort was made to

cope with this situation, particularly among auctioneers and farmer-sellers.

The visits paid to auctioneers have, on the whole, been extremely fruitful. Where any difficulty has been encountered, it has generally been due to the awkward position into which the auctioneer is put by careless clients. Many auctioneers are known either to refuse parcels of seed potatoes not accompanied by the required particulars, or else to hold the lots over until the next sale, in order that the particulars may be obtained. Firmness is required to enforce the rule, but experience shows that it can be done. Owing largely to the assistance that is being afforded by auctioneers themselves, the " auction-sale " problem is certainly becoming less acute.

A point that all sellers would do well to bear in mind is that, according to the advice available to the Ministry, in every case where potatoes are sold for planting, it is necessary for the seller to fulfil the obligations imposed upon him by the Act and the Wart Disease of Potatoes Order; and that these obligations cannot be escaped by stating that potatoes, which are obviously intended for seed purposes, are not being sold as " seed."

Twenty-six investigations were made during the season into alleged offences against the Act in relation to seed potatoes. An idea of their nature may be gained by grouping them as follows: misdescription of variety, 6 (3 of them involving other and more technical offences also); false particulars as to size and dressing, 3; statement incomplete or not supplied, 11; and auctioneers selling potatoes, apparently intended for planting, without the required particulars, 6. Legal proceedings were not instituted in any instance, but letters of warning were sent to 21 English sellers. The Scottish Department of Agriculture made inquiry into one instance in which the seed had come from Scotland, and subsequently warned the seller. Five complaints could not be followed up on account of lack of the relative documents.

Seed-Testing Course and Examination.—A course in seed testing, followed by an examination, was held at the Official Seed-Testing Station, Cambridge, during June and July, 1932. Seed firms sent 17 entrants, and 2 members of the staff of the Official Station also took the course. Fifteen of the candidates satisfied the examiners in both the theory and practice of seed analysis, and two in practical work only, while two failed in both subjects. It seems that a course at

the Official Seed-Testing Station is now coming to be regarded as part of the business training required for future directors of the more important seed firms of the country.

Seed-Analysts' Conference.—The ninth conference in this series was held at Cambridge on July 21, 1932, with Sir Daniel Hall, K.C.B., F.R.S., in the chair. The results of testing the six "referee" samples sent to the Private Stations during the season were circulated and discussed. Among the other matters considered were a paper by Mr. P. A. Linehan and Mr. S. P. Mercer (of the Ministry of Agriculture for Northern Ireland) on further experiments in the use of ultra-violet light for determining the purity of rye-grass seed; another by Mr. A. Thompson, the General Seeds Inspector of the English Ministry, describing the wild white clover certification scheme; and a third by Mr. C. H. Hunt, of Messrs. Sutton & Sons, Ltd., giving the results of experiments into the suitability of various types of sand for testing the germination of seed peas and beans. In the course of his remarks, the Chairman expressed his gratification that the Official Seed-Testing Station had emerged from the difficulties following the unsatisfactory harvest conditions of 1931 with an enhanced reputation.

Fees for Seed Testing.—The alterations in the fees chargeable by the Official Seed-Testing Station, which were sanctioned as an experimental measure for the year ended August, 1932, are being continued for another year. Full particulars were published in the March, 1932, issue of this JOURNAL (p. 1228); and they can also be obtained on application to the Ministry.

Seed-Analysts' Bulletin.—The 19th and 20th numbers of this Bulletin were prepared during the season, and appeared, respectively, in October, 1931, and April, 1932. This publication, as may be gathered from its title, is intended primarily for circulation among the commercial seed-analysts of the country, though it is sent also to a few other interested individuals. The 20th number was accompanied by a comprehensive index of the whole series. This issue contained the results of the tests on "Referee" samples, together with notes upon them. Among the subjects dealt with in the two Bulletins sent out during the year were: impurities found in red and white English clover seed; a proposed formula for purity tolerance in international trade; the use of ultra-violet light for distinguishing certain strains of perennial rye-grass;

the International Seed-Testing Congress of 1931, and the international seed-testing rules ; the report of the Official Seed-Testing Station, Cambridge, for 1930-31 ; cereal seed testing ; early pea failures ; the wild white clover certification scheme ; and crop certification in New Zealand.

Prosecutions.—Five prosecutions were instituted under the Act in respect of matters arising during the season. The first, which was heard at Kettering in May, was primarily in respect of failure to give, on demand, particulars relating to a sample of parsnip seed taken by one of the Ministry's Inspectors ; but a further charge concerned the germination of a sample of onion seed. The defendant was bound over to observe the Act and Regulations, and was required to pay costs amounting to £2 10s. 0d.

The proceedings in the second instance were in respect of a sample of onion seed contained in packets marked " 1930 " and " 1931," the germination of which was found to be only 13 per cent. The hearing took place at Alton in July, when the charge was dismissed on technical grounds.

The next case also related to a sample of onion seed, which was found to be dead. The hearing took place at Daventry in August, when the defendant was convicted and fined £1.

The last two instances both involved Hull firms. In one of them the defendants, a firm of agricultural seed merchants, were charged with making a false statement as to the purity of a parcel of white clover seed which was found, in fact, to contain some 15 per cent. of alsike. A conviction was recorded and a fine of £4 imposed. In the other, a firm of corn merchants was charged with failure to deliver the particulars required by the Act on the sale of a parcel of seed tares. In this instance, also, a conviction was secured, the defendants being fined £1 1s. 0d., with £3 3s. 0d. costs.

General.—A memorandum that has been prepared for free issue sets out in a simple way the particulars that must be stated on the sale of each kind of seed coming within the scope of the Act. It shows also where to send seed for testing, how much to send, and what the cost will be. A copy can be obtained by sending a post card to the Ministry's office, 10 Whitehall Place, London, S.W. 1.

SOME EXPERIMENTS IN SOIL HEATING

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DURING the last few years some experiments in soil heating have been carried out at this Institute. The special purpose was to compare artificial soil heating in frames with heating by fermenting of organic material in manure and straw, but heating by steaming and hot-water circulation in copper pipes has also been tried in greenhouses and in the open. Electrical soil heating was tried earlier, but has been abandoned, as it is, in most instances, far too expensive in the south of Sweden. In 1931 the following systems of heating were compared :—

- (1) By fermenting materials.
- (2) By steam in pipes of clay drain tiles or pipes of impregnated wood (the Sigma system).
- (3) By hot water in copper pipes (the Beck-Friis system).
- (4) By hot water in iron pipes.

The Sigma System.—The method of soil heating by steam has been used before, but what is new about the Sigma system is the way in which the steam and the air are introduced into the soil. As described in *The Gardeners' Chronicle*, February 27, 1932, steam at a low pressure is forced through drain tiles or pipes of impregnated wood or cement. When the steam rushes into the pipes it becomes mixed with air and is not condensed at once. Through the longitudinal seams in the cement (Fig. 1) or wood tubes the steam mixed with air is squeezed out into the soil. When hard water is used for steaming it must be treated to free it from lime and iron. Natrolithe filters for this purpose are obtainable from the manufacturers of boilers and other requisites for the Sigma system, which was invented by Mr. George E. Gjuke, a Swedish mining engineer.

The Hot-water System with Copper Pipes.—In electrical soil heating, cables are laid in the soil at a certain depth. A few years ago Baron Chr. Beck-Friis, a Swedish engineer in Stockholm, designed a system where the cables are replaced by thin copper pipes. In a common frame there can be laid down eight pipes in the ground at the same depth as the cables would be, and two above the ground under the glass. Hot water is forced through this pipe system (Fig. 2) by means of an electrical pump and led back to the boiler by an

iron pipe. The external diameter of the copper pipes is only 6 mm. The underground pipes are laid in a bed of gravel. The higher the temperature of the water is, the greater of course is the heating effect of the pipes. In this experiment the temperature was about 80° C. when the water was leaving the boiler and it decreased by about 6° C. before returning.

The copper pipe system has not been used long enough to prove its durability. Of course, the thin pipes are easily broken if water is allowed to freeze in them, and care must be taken not to damage them, when the soil in the frames is changed.

The Hot-water System with Iron Pipes.—This is the old method of soil heating by hot water. In these experiments 1 in. iron pipes were used and the water circulated without pumping. The iron pipes are laid in ordinary drain-pipes with an interior diameter of about 2½ in. In a frame 6 ft. wide four pipes are employed, the water coming in from the boiler by two of them and returning by the other two.

Experiments in Frames.—In 1931 the different hot-water systems and the Sigma system were compared with soil heating by fermenting in a bed of stable manure and straw. The experiments were carried out with melons planted out in the middle of May. The temperature of the soil was recorded every morning and an attempt was made to keep about the same temperature in the different frames.

During the period May 15 to July 5 artificial heating was used. In the copper pipe system, hot water circulated 6 hours daily and in the iron pipes about 12 hours. The temperature, however, was lower in the iron pipes, as the water in these circulated all night. The steam process was carried on only one hour daily. The first week after planting the soil temperature was a little higher in the manure frame than in the hot-water frames.

The plants in the manure frame were soon in advance of those in the others, and the first fruits of this frame matured six days earlier. In the following table are given the relative numbers of fruits of the crop (variety Sandrup):—

	<i>Time of harvesting</i>	<i>Relative crop</i>
Manure frame	July 15 to August 13	100
Sigma frame	July 24 to August 11	80.6
Iron pipes frame	July 21 to August 21	89.6
Copper pipes frame ..	July 24 to August 14	74.4

As seen from these figures the manure frame gave con-



Fig. 1. Section of the building, showing the main entrance and the tower.



Backlund

siderably more than the others. It is thought that the greater content of carbon dioxide in the air of the manure frame may have increased the crop of this frame. The results of some researches on the content of carbon dioxide in different frames make this probable. These experiments are now being continued.

Experiments in the Field.—The Beck-Friis system and the Sigma system have also been tried in the open. Tomatoes and cauliflowers were grown on these occasions. Artificial heating was used from March 16 to July 5. During this time hot-water circulated in the copper pipes six hours per day. Steam-heating went on two hours per day during the first month and later only one hour.

The mean temperature of the soil recorded in the mornings for a depth of 20 cm. was as follows :—

No heating	..	..	14.9° C.
Hot-water heating	..	..	19.0° C.
Steam-heating	..	..	19.5° C.

The plants on the heated beds soon showed a stronger growth and the crop of these plants ripened earlier.

The weight of the tomato crop during the first third of the gathering time, and the total crop from the different beds, are given below :—

<i>During the first third of the gathering</i>				<i>Total crop</i>
			<i>Kg.</i>	<i>Kg.</i>
No heating	..	..	8.73	181.98
Hot-water heating	..	..	10.42	143.32
Steam-heating	..	..	12.70	148.00

As seen from these figures the total crop was largest without heating, but the last part of the crop had not ripened and was of a rather poor quality.

The results of the experiments indicate that both the steam and hot-water systems are useful in soil-heating, and one or the other may be preferable under difficult conditions.

The Beck-Friis and Sigma systems have also been compared as to fuel consumption, when the same soil temperature is maintained in frames. The consumption is at least a third lower for the former, but on the other hand this system needs electrical energy for the water pump.

In steaming, the temperature can be raised in a shorter time than by hot-water circulation, but it ought to be mentioned that the boiler needs more attention when used for steaming than for heating water.

In conclusion, it may be mentioned that the Sigma system can be used for partial sterilization of the soil, as it is possible in a rather short time to raise the soil temperature to 70° C. and even higher when the steam is injected into the pipes by nozzles of greater interior diameter.

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ASPARAGUS

H. D. BENNETT, M.Sc.

Introduction.—The wild form of edible asparagus is widely distributed, being found native in the sandy plains of Western and Central Asia, all around the Mediterranean and up the western coasts of Europe to the English Channel. Within the British Isles, its natural habitat is confined to the western and south-western shores of England and to the coast round Wexford and Waterford in Ireland.

The plant has been cultivated to supply edible asparagus since the days of the Greeks and Romans, that from the gardens of Ravenna being famous for its high quality, although improved types of asparagus were not known until many centuries later. In the early eighteenth century, there was developed in Holland a variety having a purple colour, and from this the well-known *Argenteuil* varieties were obtained later by selection. It is interesting to note that the Washington strains of rust-resistant asparagus originated in a cross between Reading Giant, an old English variety, and a selected plant of New American, of unknown origin.

Asparagus Culture in England.—Apart from asparagus cultivated in private gardens, the commercial production in this country is confined mainly to the districts around Evesham, Colchester and parts of Cambridgeshire and Norfolk. Some asparagus is forced in the Exeter area.

The soils vary from a clayey-loam on the Lias formation in Worcestershire to alluvial soils round Colchester and the sandy loams of Cambridgeshire. Most of the cultivation is done by hand, the crowns being planted 12 in.–15 in. apart in the rows, with 3 ft.–4 ft. between the rows. Green asparagus, i.e., cut above the surface of the ground, only is grown.

The seed is sown in drills 1 ft. apart about the middle of April. In the following year, the plants are dug up and the best crowns selected for planting into permanent quarters. The practice of leaving crowns for two years before transplanting is gradually dying out. The plants are set 4 in.–8 in. deep

and the soil is hoed round the crowns. No cutting is done during the first two seasons of permanent planting, but the beds are regularly hoed and kept free from weeds. In the early part of the third year a small amount of cutting is done from about the end of April to the middle of June, but in the fourth year the bed is cut over the whole of this period.

Farmyard manure is applied at the end of the season, and this is worked into the soil when the foliage has died down.

Agricultural salt at the rate of 2-3 tons per acre is applied just previous to cutting. The "grass" is graded and sold in bunches, prices being according to grade. There are four dozen bunches to a flat, the inside dimensions of the flat being 20 in. by 14½ in. by 9 in. Each bunch is about 3 in. diameter and weighs about ¾ lb. The stalks are placed head to head and packed in a little straw. The bunches consist of about 3 in. green and 4 in. white in the stalk.

Asparagus Culture in California.—The chief asparagus region in California is situated in the Sacramento Delta (60,000 acres) between 50 and 80 miles north of San Francisco. Most of this land, of a peaty nature combined with alluvial deposits, has been reclaimed through the restriction of the river to well-defined limits by throwing up huge banks or levees to prevent flooding. The river water is utilizable, however, for irrigation purposes. In Southern California, in the Imperial Valley, where some of the earliest asparagus is grown, the soil is of a sandy, silty nature.

Nursery Practice.—One of the first considerations for the establishment of an asparagus plantation is the selection of the best seed. Selected crowns in the proportion of one male plant to five female plants are planted in isolation, grouping the female plants round the male. Only the healthiest crowns are used.

Isolation may be effected in the field by marking selected crowns and allowing them to produce seed, other stems being cut. The seed is ready for harvesting in November. The fruits (seed pods) are first threshed and screened, then placed in water in a trough where the skins are removed by trampling on the screened fruits with the feet. The seeds receive another washing and are then spread to dry.

The best kind of soil for the seed-bed is a light sandy soil with some well-decomposed peat thoroughly incorporated with it. The seed bed should be worked to a fine tilth.

About April 1, the seed should be sown or drilled 3 in. deep in rows 18 in.-24 in. apart at the rate of 15 lb. of seed to the acre. The practice has been to sow in a V-shaped drill, but, in 1926, at the Montezuma Ranch of the California Packing Corporation, Rio Vista, seed was sown in a much wider drill, thus ensuring an even distribution of the seed in the drill by means of a spoon-shaped attachment to the delivery end of the seeder. It has been found that sowing in this way is much more economical both from the amount of seed required and the saving in labour in separating the crowns for transplanting.

The plants should appear above ground in 14-18 days, and as soon as they are high enough to make the rows discernible cultivation starts and is continued through the season. The ground is kept moist by irrigation until the middle of June. One acre of roots suffices for the planting of thirty acres of asparagus, but no transplanting is done until the following January.

Establishment of the Plantation.—The crowns should be carefully selected, the small crowns being discarded as well as large crowns having a large number of small buds. It has been found that it pays to plant only first-grade crowns, and that it is not profitable to plant second-grade crowns or to grow them on in the nursery for a second year, as they do not stand the second transplanting at all well, nor do they catch up with the one-year crowns. In short, it is becoming the practice to plant only first-grade crowns when one year old.

The asparagus fields should be loam containing a fair percentage of organic matter. In California they are sub-irrigated—the irrigation ditches being five feet deep running at intervals of twelve hundred feet.

The selected crowns are placed 16 in.-18 in. apart in rows running east and west with 8 ft. between the rows. 3,700 plants are required per acre if the plants are planted at 18 in. apart. The crowns are placed by hand in furrows got out to a depth of 16 in.-18 in. by ploughs and finally are covered with two inches of soil. In the first year the weeds are kept down and the soil cultivated and irrigated.

Management of the Beds after the First Year.—During the first and second years of the life of an asparagus plantation, an intercrop, usually beans, may be grown. In the first year little or no grass should be cut. The amount of

cutting in the next three years, i.e., until the crop comes into full bearing, is as follows :—

2nd year .. 1,500 lb. per acre.

3rd year .. 3,200 lb. per acre.

4th year .. 4,200 lb. per acre.

Throughout the cutting season, the spaces between the rows are cultivated as often as necessary. About the last week in June the levelling and knocking down of the ridges begins. This operation is begun by disking the ridges (using centre-disks reversed), and a 30 h.p. tractor follows pulling a drag pole weighed down with a piece of railroad iron. By disking with two horses, 10 acres a day can be covered, while the drag can do 70 acres per day, thus it is necessary for the disking to be given a start. Dragging is followed by a harrow which levels the ridge. These operations are completed in the first week of July and the asparagus is left to grow to fern.

Cultivation and irrigation begin about the middle of July and continue until the fern gets too thick. At the end of the growing season the fern is mown off, collected into heaps and burnt to destroy insect pests.

Method of Handling Fresh Asparagus for Shipment.—In the early spring or late winter, the land is worked to a good tilth and 8 in. of soil are thrown up into a ridge by a ridging plough over the crowns. The cutting season for green asparagus commences about the middle of March and continues as long as the weather is favourable. Cutting commences early in the morning as soon as it is light and continues until early in the afternoon. Each cutter walks between two rows and cuts the asparagus shoots, several inches below the top of the ridge, with a special knife, consisting of a piece of iron about two feet long, of which three inches at one end is flattened to form a blade. The shoots that have protruded above the surface of the soil are sold as "green."

The cutters collect the grass, laying it in small bundles on top of the ridge. The gathering sleds, drawn by horses, travel slowly between the rows while the driver collects the bundles. To facilitate gathering, he has a piece of string 12 in.—15 in. long dangling from his thumb, which he passes round the top of the bundle with his other hand, picking it up, thus ensuring rapid collection.

In some instances, the grass is collected in lug boxes in the field and sent to a packing shed some distance away to be graded

and bundled for shipment to market. Sleds are driven to the packing sheds near the fields, the asparagus taken out and placed in a trimming rack tip foremost and clamped down to prevent tearing. The ends project and can be cut off with a saw. The rack has an adjustable back so that the grass may be cut to the desired length.

Moss, soaked in a trough at the back of the rack, is used for lining the bottom of the pyramid crates in which the grass is packed and tissue paper is used to line the sides. Each pyramid crate contains from 32 lb.—35 lb. of grass. This grass is not usually graded in the strict sense of the word, but any small pieces are generally thrown out.

The chief market for green grass is the Eastern United States, although both the San Francisco Bay District and Los Angeles take a certain amount, and some is sold locally.

Further Aspects of Asparagus Cultivation : Manuring.—Although a number of experiments with different kinds of artificial manures have been carried out by various growers in the Delta section, results so far have not indicated a definite system of manuring, for the unmanured plots seem to give as good yields as the manured plots.

From a study of the very limited amount of literature on asparagus, it seems that the Delta soils have at present a sufficient amount of nutrient elements readily available in the soil, and the addition of chemical fertilizers is unnecessary.

The use of salt for the manuring of asparagus has long been in vogue, the basis of its use being that as *Asparagus officinale* is a native of the seaside it should benefit by the application of salt. The use of salt as a manure for asparagus has beneficial results, but these results are due to the fact that the salt replaces and sets free potash, which is utilized by the plant. Therefore potash in some form is an important fertilizer for use in the production of good asparagus.

Asparagine, the substance that gives to asparagus its peculiar taste, has ammonia as its essential basis and therefore nitrogenous fertilizers are necessary in its development. These facts suggest that a complete fertilizer, such as a mixture of sulphate of ammonia, sulphate of potash and superphosphate, applied to the plants in spring, should be of considerable value in the production of fine-flavoured asparagus. A top-dressing of nitrate of soda applied at the end of the cutting season helps to produce a good "bower" upon which the plant largely relies for reserve food material to form good spears in

the following season. The quantities of fertilizer to be applied must for the present be a matter of careful experimentation and record.

Asparagus Rust (*Puccinia Asparagi*).—Asparagus rust, first reported to have made its appearance in California in 1901, has become the most serious disease of asparagus. Rust, *Puccinia Asparagi*, was described by Smith⁴ as follows :—

“Rust is a disease which does not directly affect the asparagus which is cut for market, but makes its appearance only on the green tops which grow after cutting has ceased. By killing these tops, which should grow and store up strength in the roots for next year's crop, the disease weakens the plant, diminishes the yield and quality of the product and if severe enough kills the whole plant.”

All investigators agree that proper cultural methods will give a better control of rust than any spraying. It is essential to keep down weeds by continual cultivation, to burn the tops after mowing them off, to pay attention to irrigation and to space the plants so as to allow plenty of air to circulate. If recourse is made to sprays, the most effective in California appears to be the application of sulphur either in the form of a dust or spray, proper care being taken to see that the plant is well covered with the spray material. An effective spray is a resin-Bordeaux mixture of the following composition :—

Bluestone (copper sulphate)	..	10 lb.
Lime .. .. .	..	13 lb.
Resin .. .. .	..	5 lb.
Soap .. .. .	..	8 lb.
Water .. .. .	..	100 gal.

The planting of rust-resistant varieties is now largely practised, the following varieties being more or less immune :—

Palmetto (moderately resistant).
 Martha Washington (resistant).
 Mary Washington (highly resistant).

Special Cultivation for Canning Crops.—By far the largest proportion of the asparagus grown in the Delta section goes to the cannery, and, generally, the grower has a contract with the cannery to take all his grass.

The grower ridges his asparagus to a height of 12 in. or more, using ridgers drawn either by horses or tractors. The tractor ridgers are hooked up in sets of two, completing two ridges at a time. A 30 h.p. tractor is able to ridge 28 acres per day, while a horse-drawn ridger will do 10 acres per

day. The ridges are re-built about every fourteen days during the season.

The cutting season starts on April 8 and ends about July 1. On account of the rapidity with which it deteriorates asparagus is canned the same day as it is cut, consequently cutting commences as soon as it is light and continues until the fields have been gone over.

The cut grass is hauled to the packing shed on sleds and there washed and trimmed, packed into lug boxes and transported to the cannery in trucks.

The stalks are trimmed, as previously described, to the length of about 7 in. After trimming, the grass is washed, the loose heads being first sprayed with water to remove loose dirt and, finally, gently rubbed together in a trough of water. The stalks must be washed as soon as cut to prevent staining by the dirt. The loss in cutting and sorting at the washing house is estimated at about 18 per cent.

On arrival at the cannery, the asparagus is hand-graded by women, who sort the stalks into as many as eleven different grades. Grading is done on the basis of size and colour, three colours being recognized, viz., white, green and blue. Blemished stalks are thrown out.

The 3-lb. boxes for graded asparagus are 5½ in. deep for stalks that are to be placed in No. 2½ cans, 4 in. deep for stalks to be placed in No. 1 cans and 3 in. deep for the asparagus tops which are canned in No. 1 cans. The asparagus is placed in the boxes top foremost so that the top is against the closed end of the box, the stalk end being free. The sides of the box have from one to three vertical cuts in them, so that the asparagus can be trimmed to the desired length by means of a butcher's large knife. The loss in cutting is from 50 to 75 per cent. A small quantity of the largest stalks is peeled by hand before canning.

Blanching is done by placing the graded stalks in large wicker baskets which are then immersed in a tank of boiling water and left for [3-4 minutes, being stirred with large wooden paddles. This also gives the spears a final washing, making them more pliable and more easily handled.

The blanched asparagus, after subsequent immersion in cold water, is taken at once to the canning tables, where it is placed in water in glass-lined sinks, sorted, and packed into cans. Square cans are usually used for asparagus as the vacuum produced in a square can after cooking draws in the four sides and holds the spears together so that they cannot

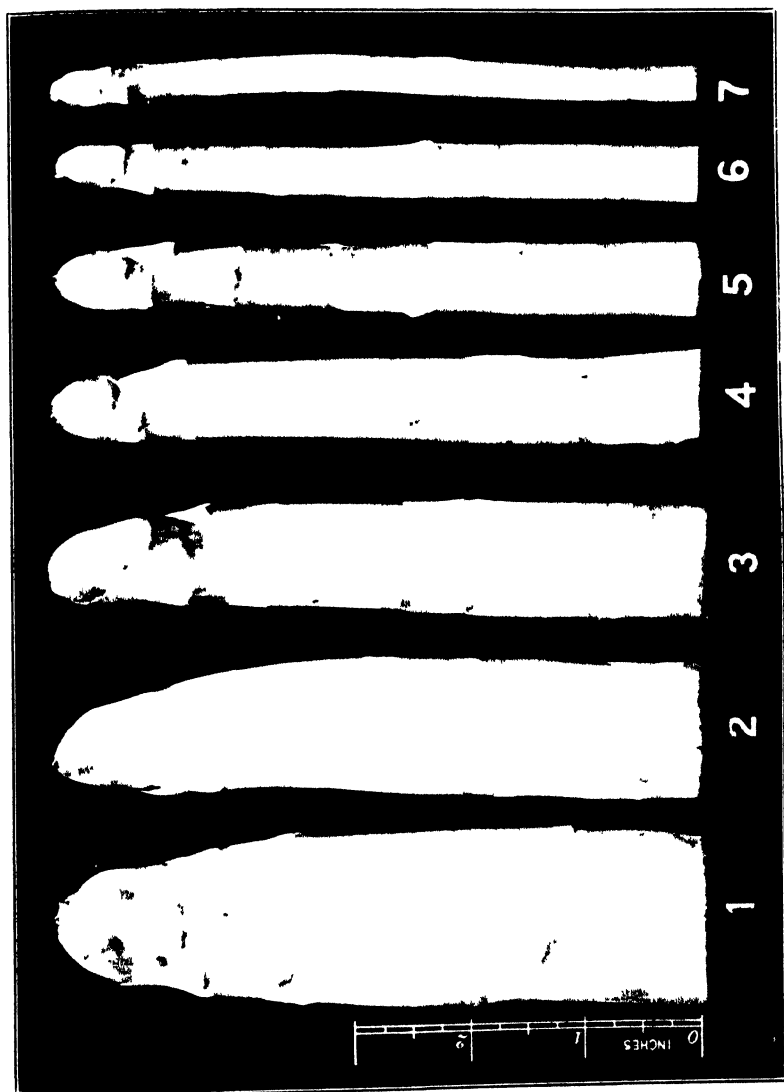


Plate 1 of 14 figures.



Transferring asparagus from the field sledge to the rack for cutting, at the requisite length.



Interior of asparagus picking shed, showing the field sledge to right, and the racks in which the asparagus is placed for cutting. Note the saw used for cutting, standing upright against the field sledge.

rub each other and remove the side leaves and buds. The cans are filled with a $2\frac{1}{2}$ per cent. salt solution and sealed—then sterilized for 25–30 minutes in steam retorts at 233°F . The cans are cooled and stored usually for several weeks. If any asparagus is left over from the day's cut, the canneries usually can the tips of the spears only.

Improved Strains of Asparagus : (a) *Segregation of Sexes.*—The asparagus plant (*Asparagus officinale*) is dioecious, i.e., male and female flowers are found on different plants.

Robins and Jones,¹ experimenting with the variety Palmetto, compared the yield from male and female plants and found that male plants produced the greatest weight of spears per acre (in four years the figures were 11,587 lb. for the male compared with 8,467 lb. for the female plant) and that the male plants produced an average of 70.5 spears per plant against 44.8 spears for the female plant. A comparison of the size shoot produced showed that the male plants produced 60.4 per cent. of spears under $\frac{1}{2}$ in. diameter, measured $5\frac{1}{2}$ in. from the top of the spear, compared with 34.4 per cent. for the female plant. These figures show that while the greater number of spears is produced from male plants and also the greater weight per acre, the female plants produce the larger percentage of the best grade of spear. Thus, a grower who could obtain a plantation of purely female crowns would obtain the best grade of produce, but, in a commercial plantation, a proportion of 50 per cent. male and 50 per cent. female plants is now usual.

Another great advantage of having a plantation of one sex, apart from the standpoint of market requirements and size of spear, is that the bed does not become choked with seedlings from promiscuous crossings. In California, a large percentage of both male and female plants appear in the first year, which is not the case in England. The selection of plants of one sex greatly increases the cost of establishing a bed, but the results would, in a few years, outweigh the initial outlay, increasing the life of the bed.

(b) *Selection of Crowns.*—Experiments on crown selection for planting have shown that medium to large crowns with a small number of buds are preferable to large crowns with a large number of buds, and all small crowns should be discarded.

(c) *Seed Selection.*—In commercial practice, seed-saving is usually effected by the selection of seed from a healthy female.

This, at the best, is only half selection, for the male parent is unknown: indeed, there may be many males pollinating the same female, all of them being unknown. Experiments are in progress with the object of producing seed of known healthy parentage, and every grower is in a position to carry out similar experiments in the field.

A knowledge is required of the cropping records of certain crowns and of their sex. If two crowns, one male and one female, of a good healthy appearance, productive, and situated near to one another in the plantation, are marked at the end of the growing season and the grass they produce is not cut in the following season, it will be found that they will produce their flowers much in advance of the plants that are cut. The female will thus be pollinated by the selected male plant, and the progeny will be the result of this known cross.

If the quantity of seed required is large, a number of pairs will have to be selected, and it is advisable to select these as far apart as possible. In a more controlled way, the female plants can be covered with muslin and hand pollinated, but a smaller crop of seed results, probably due to the enclosing of the female plant. Seed selection is of great importance in the production of good asparagus.

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DUSTING FOR THE CONTROL OF APPLE SAWFLY: A PRELIMINARY EXPERIMENT

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DURING the past few years, attacks by Apple Sawfly (*Hoplocampa testudinea* Klug.) have been generally serious and, in some localities, responsible for very heavy losses. One correspondent estimated his loss through this insect, in 1932, at not less than £1,000.

The general outlines of the life history have been known for some time and recent research has discovered many of the details. The following brief résumé* gives most of the important particulars.

The apple sawflies (Fig. 1) are small, dark brownish-red insects with two pairs of transparent wings. Towards the end of April and in early May, they can be found about the apple blossoms. In bright sunshine, especially during the morning when the temperature is rising, they are very active and run about the leaves and blossoms with their head feelers vibrating rapidly. During periods of activity, they can be observed feeding on drops of moisture, nectar and pollen, mating and laying eggs.

The eggs (Fig. 2) are laid in the receptacle of the blossom, that is, in the part which later develops into the fruit. They are inserted just below the calyx and lie in the tissue at the base of the petals and stamens. During the period of incubation, the eggs swell and often rupture the tissue above them, so that they can be seen with the naked eye, lying wholly or partly exposed within the blossoms. Hatching takes place in from 8 to 15 days, the period being influenced by weather conditions.

When the young caterpillars emerge from the eggs they are actually outside the fruit and have to eat their way in. Some enter the fruit from within the shelter of the shrivelling petals and stamens, but most of them crawl outside the calyx and enter the fruit from the side. Usually, only one caterpillar attacks a fruit, although occasionally up to three individuals may be found. The caterpillar penetrates to the core and feeds mainly on the developing seeds or pips. After moulting twice it leaves the fruit by a hole in the side and penetrates a second and larger fruit, again from the side. It usually reaches

* For further information see: (1) Advisory Leaflet No. 13, Ministry of Agriculture. (2) *Annals of Applied Biology*, 1932, xix, pp. 420-431.

maturity in the second fruit about six or seven weeks after the egg was laid.

Not all the newly-hatched caterpillars are successful in penetrating to the core of the fruit. Some of them tunnel just beneath the skin and as the fruit swells the skin over the tunnel breaks and a scar (Fig. 4) that the fruit carries until harvest* follows the line of the tunnel.

The caterpillars (Fig. 3) of the Apple Sawfly are whitish, with the head black and shining and with black or dark-brown chitinous plates covering the segments at the tip of the body. When fully grown they measure up to $\frac{1}{2}$ in. in length. The dark plates at the tip of the body become pale and less conspicuous, and the head becomes yellowish-brown with only the eyes and jaws dark brown. The body is thick behind the head and tapers rather rapidly, so that the caterpillar has a somewhat humped appearance.

The mature caterpillars leave the infested fruits and enter the soil. Usually they tunnel to a depth of 3 to 9 in. and construct parchment cocoons in which they spend the winter. Pupation takes place in the spring and the adults emerge towards the end of April.

Attack by Apple Sawfly can be readily recognized in the fruit plantation. It is associated with an excessive fall of newly-set fruit. In an infested plantation, the fallen fruits have holes in the side from which quantities of brownish frass protrude. If these fruits are cut open, the middle is seen to be a wet, decaying blackish or brownish mass, and whitish caterpillars may be found within (Fig. 5). After the larvae have migrated from the fruitlets first attacked, larger fruits with holes in their sides may be seen hanging on the trees. Where an attack is in progress, the strong and rather offensive odour of the caterpillars is usually noticeable and workers in the plantations are quick to detect it.

Control Treatment.—Particulars of treatment with lead arsenate and nicotine sprays have already been published in this JOURNAL by Petherbridge and Tunnington,† and recent work, by Petherbridge at Cambridge, and by the Long Ashton Horticultural Research Station, has given further information on the value of nicotine and indicated the importance of the accurate timing of the spray to catch the hatching and migrating larvae.

* *Journal of Pomology*, VII, Nos. 1 and 2, p. 60.

† This JOURNAL, February, 1929, p. 1055.

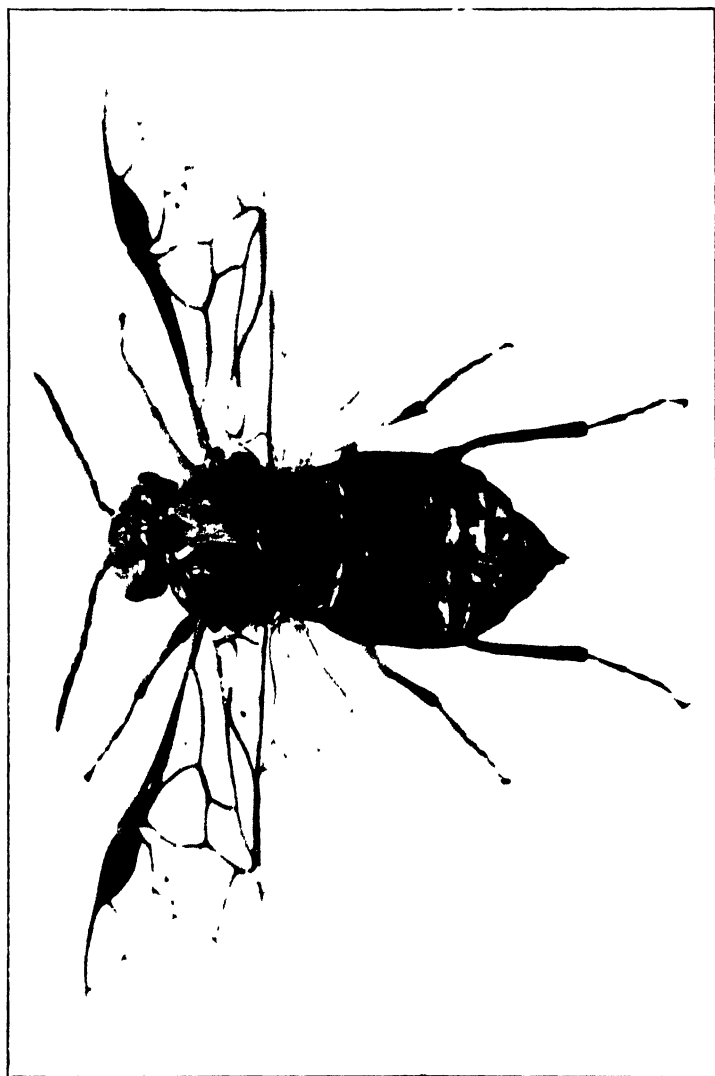
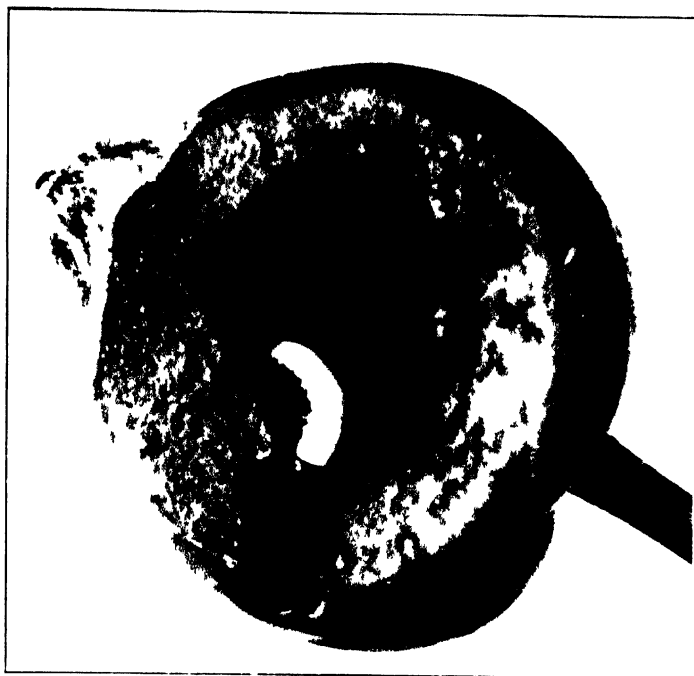


FIG. 1. Apple Sawfly, female (*Haplometa testudinaria*) 10



FIG. 2.—Flower with petal and one sepal removed to show egg of Apple Sawfly in position.



11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



Observations by the writer showed that female sawflies were present in a plantation of mixed varieties for about a fortnight, and this suggested that there might be considerable difficulty in timing a nicotine spray to catch larvae hatching and migrating over a similar period. In practice, the critical time depends on the flowering period of the variety, and it would be necessary to arrange spraying to suit the varieties. With mixed varieties, this is difficult, and it seemed desirable to experiment with other methods of control.

In 1932, arrangements were made at the Cheshire School of Agriculture to test the value of a repellent that might either drive away the egg-laying females or render the fruit blossom unattractive to them. Naphthalene, a well-known repellent, was selected, and a dust containing about 30 per cent. of pure naphthalene was obtained through the courtesy of a firm at Widnes. The variety "Worcester Pearmain" was selected for the tests because it appeared very susceptible to sawfly attack. The trees available were apportioned out to give blocks of three trees, alternating treated and untreated plots. The trees were bush type averaging 8 to 9 ft. high and with a branch extension of about 6 ft.

The first application of dust was made on May 24, when 10 to 20 per cent. of the blossom was open; and further applications were made on May 28, June 3, and June 6. On the final date, only the last 10 to 20 per cent. of the blossoms remained open. The dust was used at the rate of 3 lb. for 20 trees at each application. It was exceedingly light and adhered well to the foliage and blossoms, and the smell of the naphthalene was evident for several days after the applications, especially during the warm sunny periods when the sawflies were most active.

About a fortnight after the last application, when it was seen that larvae had hatched and penetrated the young fruits, both treated and untreated trees were examined and the infestation recorded from the centre tree in each block of three. The set of fruit varied considerably from tree to tree, as is usual in young plantations, but there were no indications that the dust had adversely affected fruit setting. The following table shows the amount of infestation in the fruits examined.

Date of examination	Plot	Total fruits examined	Number infested	Number healthy	Percentage attacked
June 6	Dusted	500	8	492	1.6
	Untreated	500	62	438	12.4
July 6	Dusted	1,521	107	1,414	7.0
	Untreated	1,506	385	1,121	24.9

In the first count, it was found that while over 12 per cent. of the fruit examined from the untreated plots was infested with sawfly larvae, less than 2 per cent. were infested on the trees that had been dusted with naphthalene. The second examination was made when the attack had reached its height and no further fruits were likely to be infested. The effect of the treatment was still evident, since about 25 per cent. of the fruit from the untreated trees was attacked and only 7 per cent. was attacked on the dusted trees.

It is probable that the value of the dusting was greater than the figures indicate. The odour of the dust permeated through the whole section of the fruit plantation and this seemed to reduce infestation on the untreated check trees. This assumption was justified by the observation that other varieties of fruit trees at a greater distance from the dusted trees showed 30 to 40 per cent. infestation.

Conclusion.—From the foregoing account, it is apparent that attack by Apple Sawfly can be reduced by dusting the trees at blossoming with a naphthalene dust. In these trials, the dust appeared to reduce attack and at the same time did not interfere with the setting of the fruit. Dusting is a fairly rapid operation and an extensive plantation can be dusted in a comparatively short time. If growers wish to give the treatment a further test, several light dressings should be applied, because the blossoming period lasts several days for each variety, and in the dust form naphthalene is in such a fine state of division that it volatilizes quickly.

Acknowledgments are due to Principal W. B. Mercer, B.Sc., and the Horticultural Staff at the Cheshire School of Agriculture for their co-operation in connexion with the experimental work.

SUGAR-BEET INDUSTRY IN GREAT BRITAIN

FINANCIAL POSITION OF THE FACTORY COMPANIES

A REVIEW of the financial position of the beet-sugar companies as at March 31, 1931, and of the trading results of the 1930-31 manufacturing campaign was published in the issue of this JOURNAL for February, 1932. In the present article similar information is given for the year ended March 31, 1932. These articles continue the information given on this subject in the "Report on the Sugar-Beet Industry at Home and Abroad."*

Table I gives a summary of the combined balance sheets of 15 companies (representing 18 factories) operating in Great Britain, and shows the financial position of the companies as a whole as at March 31, 1932. Comparative figures are printed for the year ended March 31, 1931 (see also Table 67 of the Sugar-Beet Report).

Reserves and credit balances on profit and loss account totalled £1,849,777, of which the sum of £194,125 was appropriated to payment of dividends, leaving £1,655,652 to be carried forward. The latter figure is equivalent to over 25 per cent. of the total share and loan capital. It will, however, be noted that there is included in this figure a sum of £183,297, representing advances paid under the British Sugar Industry (Assistance) Act, 1931, which are contingently repayable, and also a further sum of £135,392 placed to various special reserves for the purpose of meeting certain other contingent liabilities.

The amount paid in dividends for the year 1931-32 (£194,125) was 4·4 per cent. of the aggregate share capital, as against £411,562, or 8·8 per cent., in the previous year.

The position regarding expenditure on plant, machinery and equipment to date is as follows :—

	£	£
Total expenditure		8,771,743
Less Depreciation	2,986,283	
Written off on reconstruction ..	153,288	3,139,571
Balance as per Table I		<u>5,632,172</u>

The capital cost per ton of beets worked in the factories for the manufacture of sugar during the season 1931-32 was

* Economic Series No. 27 : H.M. Stationery Office, 1931 (price 6d. net, post free 1s.).

TABLE I.—SUMMARY OF BALANCE SHEETS OF BRITISH BEET-SUGAR FACTORY COMPANIES AS AT MARCH 31, 1931 AND 1932.

	As at March 31		Increase or decrease
	1931	1932	
<i>Liabilities</i>	£	£	£
Share capital	4,678,640	4,445,954	— 232,686
Mortgages and debentures ..	1,846,087	1,545,951	— 300,136
Bank and other loans	718,741	902,050	+ 183,309
Sundry creditors & outstandings	962,855	722,573	— 240,282
Reserves*	1,365,401	1,447,717	+ 82,316
Profit and loss balances before appropriation of dividends, less deficits	741,613	402,060†	— 339,553
Total liabilities	10,313,337	9,466,305	— 847,032
<i>Assets</i>			
Beet-sugar factories and equip- ment, less depreciation ..	5,927,086	5,632,172	— 294,914
Investments	836,722	820,462	— 16,260
Stocks and stores	1,684,368	1,960,294	+ 275,926
Sundry debtors and prepayments	934,222	601,066	— 333,156
Cash balances	888,626‡	452,311	— 436,315
Preliminary expenses	42,313	—	— 42,313
Total assets	10,313,337	9,466,305	— 847,032

* Including capital reserves; also special reserves amounting to £20,276 in 1931 and £318,689 in 1932, of which £183,297 represents advances under the British Sugar Industry (Assistance) Act, 1931, which are contingently repayable.

† Including £65,727 appropriated from general reserves for the payment of dividends.

‡ Including dividend of a private company paid on account before date of balance sheet.

£5·3 as against £2·8 in the previous season and £4·2 in 1929-30. This increase was largely due to a fall in the tonnage of beet worked, from 3,060,498 tons in 1930-31 to 1,667,275 tons in 1931-32. The manufacturing season was very much shorter than in the two preceding years, being 64 days compared with 111 days in 1930-31 and 91 days in 1929-30. The average daily quantity of beets worked throughout the season 1931-32 was 26,051 tons as compared with the average of 27,572 tons in the previous year.

Table II has been compiled from data supplied by the factories, and shows the total manufacturing costs and charges under the various main subheads of expenditure, together with the corresponding costs per ton of beet worked. The interpaces in the costs per ton of beet shown under the subheads

TABLE II.—MANUFACTURING COSTS AND OVERHEAD CHARGES OF BRITISH BEET-SUGAR FACTORIES FOR THE YEARS 1930-31 AND 1931-32. TOTAL AND PER TON OF BEET WORKED.

Item	1930-31		1931-32		Increase or decrease per ton of beet
	Total	Per ton of beet	Total	Per ton of beet	
	£	s. d.	£	s. d.	s. d.
Coal and coke ..	449,640	2 11	239,108	2 10	- 0 1
Limestone	94,856	0 7	48,230	0 7	—
Bags	217,620	1 5	90,328	1 1	- 0 4
Other manufacturing supplies	152,224	1 0	85,151	1 0	—
Repairs and mainten- ance	217,143	1 5	108,285	1 4	- 0 1
Salaries and wages ..	802,775	5 3	502,797	6 0	+ 0 9
Rates and insurance ..	56,259	0 4	50,621	0 7	+ 0 3
Other general charges ..	97,182	0 8	75,325	0 11	+ 0 3
Beet expenses ..	303,247	2 0	94,110	1 2	- 0 10
Totals	2,390,946	15 7	1,293,955	15 6	- 0 1

of salaries and wages, rates and insurance and other general charges, resulting from the lower tonnage worked, were counterbalanced by economies in other services, mainly in beet expenses. The net result is that the total cost per ton of beet is one penny less than the figure for 1930-31.

Table III gives a summary of the trading and profit and loss accounts for the season 1931-32, with comparative figures for the preceding season. The total income from products, after deducting excise duty on sugar, was £3,293,820 or 39s. 6d. per ton of beet, compared with £5,245,396 or 34s. 4d. per ton in 1930-31. The total profit, including subsidy and profits of subsidiary industries, less cost of beets, manufacturing expenses, and overhead charges, was 4s. per ton of beet as against 9s. 10d. in 1930-31, the decrease being due mainly to the reduction in the rate of subsidy.

The total appropriations exceeded the total profit by £263,500, and to meet the deficiency thus created £166,111 was taken from credit balances as at March 31, 1931, and £97,389 was transferred from reserves. In relation to the total capital employed, the amount distributed in dividends and interest, less interest received from investments, was 3·8 per cent.; the amount applied to writing down the fixed assets was 2·8 per cent., and the amount placed to reserve was 0·2 per cent.

TABLE III.—BRITISH BEET-SUGAR FACTORY INCOME, EXPENDITURE AND PROFITS FOR THE YEARS ENDED MARCH 31, 1931 AND 1932. TOTALS OF ALL FACTORIES AND AVERAGES PER TON OF BEET WORKED.*

	Total		Per ton of beet	
	1930-31	1931-32	1930-31	1931-32
<i>Income, expenditure and profits</i>	£	£	s. d.	s. d.
Net income from sugar (less excise duty)	4,532,535	2,871,415	29 8	34 5
Molasses	135,960	31,740	0 11	0 5
Pulp	574,532	389,825	3 9	4 8
Lime sludge	2,369	840	—	—
Total income from sale- able products	5,245,396	3,293,820	34 4	39 6
Add subsidy†	6,138,965	1,791,792	40 1	21 6
Total income	11,384,361	5,085,612	74 5	61 0
Less cost of beets	7,625,741	3,529,093	49 10 (67 %)	42 4 (69 %)
Balance to factories	3,758,620	1,556,519	24 7	18 8
Less manufacturing costs and overhead charges	2,390,946	1,293,955	(33 %) 15 7	(31 %) 15 6
Trading profit	1,367,674	262,564	9 0	3 2
Profit on subsidiary indus- tries	132,915	67,011	0 10	0 10
Total profit	1,500,589	329,575	9 10	4 0
<i>Appropriations of profit</i>				
Interest charges‡	95,820	70,286	0 8	1 0
Directors' fees	30,685	22,702	0 2	0 3
§ Depreciation of stocks, etc.	15,252	56,922	0 1	0 8
Depreciation	461,119	195,972	3 0	2 4
Income tax	274,915	37,441	1 10	0 5
Dividends	411,562	194,125	2 8	2 5
Reserves	211,236	15,627	1 5	0 2
Total appropriations		593,075		7 3
Less £				
Transfer from re- serve 97,389				
Amounts taken from credit bal- ances as at March 31, 1931 166,111		263,500		3 3
Trading profit as above	1,500,589	329,575	9 10	4 0

* The figures are based on the confidential trading and profit and loss accounts of all the companies.

† Excludes advances under the British Sugar Industry (Assistance) Act, 1931, which, being contingently repayable, are not regarded as income, but a liability (see Summary of Balance Sheets, Table I).

‡ After deduction of income from investments.

§ Preliminary expenses, etc., written off (1930-31).

The net total profit made by the factories during the year on their subsidiary industries was £67,011 as against £132,915 in 1930-31.

* * * * *

MARKETING NOTES

National Mark Eggs.—The National Mark Egg Scheme, which was launched on February 1, 1929, has entered upon its fifth year of operation, and the following is a brief review of progress.

The table below shows, for each month of the years 1930, 1931 and 1932, the total output of the authorized packing stations and the quantity of eggs packed under the National Mark :—

Month	1930			1931			1932		
	Total output of Packing Stations (fresh eggs)	Output under the National Mark	Per-centage of total output under the National Mark	Total output of Packing Stations (fresh eggs)	Output under the National Mark	Per-centage of total output under the National Mark	Total output of Packing Stations (fresh eggs)	Output under the National Mark	Per-centage of total output under the National Mark
	Millions	Millions	Per cent.	Millions	Millions	Per cent.	Millions	Millions	Per cent.
Jan. ..	16.6	11.8	71	21.5	16.0	74	27.2	21.9	80
Feb. ..	15.5	11.0	71	21.9	17.0	78	30.7	25.6	84
Mar. ..	22.1	15.7	71	31.6	24.3	77	45.2	36.3	80
April ..	24.4	17.6	72	34.6	25.0	72	43.5	34.7	80
May ..	26.0	18.1	70	32.5	23.4	72	40.1	32.6	81
June ..	21.0	14.7	70	31.5	23.4	74	38.1	30.3	80
July ..	20.0	14.2	71	26.4	19.8	75	30.9	24.8	80
Aug. ..	17.4	12.6	72	22.1	17.0	77	28.8	23.2	81
Sept. ..	16.7	12.0	72	23.5	18.7	79	27.6	22.7	82
Oct. ..	14.2	10.1	71	21.5	16.4	76	23.8	19.5	82
Nov. ..	12.3	8.7	71	18.9	13.8	70	21.2	18.2	86
Dec. ..	16.3	12.4	76	24.8	19.0	77	27.2	22.7	83
Total ..	222.5	158.9	71	310.8	233.8	75	384.3	312.5	81

The increase in 1932 as compared with 1931 amounted to 74 millions in total output, and 79 millions in National Mark output, whilst the percentage of output packed under the Mark rose from 75 to 81 per cent. The National Mark output of 1932 was practically double that of 1930.

This rapid development is only to a small extent due to the increased number of authorized stations, since the number of authorized packers at the end of 1932 exceeded by six only the number authorized on December 31, 1930. The result is mainly due to the increased production of home-produced

eggs and, more especially, to the growing realization by producers that the packing stations afford the most satisfactory outlet for their supplies.

The following table gives a broad idea of the expansion in the output of packing stations :—

Output	No. of stations		
	1930	1931	1932
Over 10 million eggs	—	1	4
5 to 10 " " " " "	3	10	14
2 to 5 " " " " "	28	36	38
Under 2 " " " " "	109	93	90

The stations include producer-controlled co-operative organizations, wholesale and retail firms—some of which pack almost exclusively for their own requirements—auctioneers and producers. Their annual output varies in quantity from the many millions packed by the large stations employing a regular staff of from 12 to 20 people, to the few thousand dozens handled by the small "family" stations operating in rural areas. Many of the stations are now working to capacity and, in anticipation of increased supplies, are enlarging their premises or installing additional or more modern equipment. Practically every station is now using up-to-date mechanical weight-grading apparatus.

No important alterations of the scheme were made during 1932, but, in view of the considerable improvements that have taken place in the equipment and in the organization and working of the stations since the scheme was instituted, the National Mark Egg and Poultry Trade Committee, who are responsible for recommending applications for authorization, recently decided to insist on a higher standard of efficiency from applicants for authorization in future. The premises and equipment of an applicant must not only provide for efficient work on the scale contemplated at the time of authorization, but must be capable of meeting the needs of a rapidly expanding output. Up-to-date candling and grading equipment is required, together with an efficient service to producers. The purchase of supplies on a grading-out basis, which is being adopted by existing stations in increasing numbers, is also advocated. This method of purchase is greatly to the advantage of producers of eggs of a high standard of quality, and all new stations are expected to undertake business on these lines.

Continued expansion of the scheme is still necessary to ensure an increase in the quantity of graded eggs available for supplanting imported supplies. In some areas, new packing stations are needed, whilst in others existing stations require additional and more loyal and consistent support from producers, particularly from those who, in the past, have adopted the short-sighted policy of making use of the stations only during periods of heavy production. It is clear that producers cannot reap the full advantage of improved marketing unless the packing stations are assured of continuity of supplies, and this connotes the unceasing support and good will of producers themselves.

National Mark Dressed Poultry.—The output of the authorized packing stations during 1932 was 305,993 birds, of which 79,984 were packed under National Mark labels. The corresponding figures for the previous year were 120,404 and 47,647, respectively. Two further packers have recently been authorized.

Marketing Demonstrations.—A demonstration of the scheme for the direct consignment of cattle from farm to abattoir for sale on a dead-weight and National Mark grade basis was given by the Ministry at Barnstaple on January 27 in co-operation with the Devon County Agricultural Committee and the National Farmers' Union.

Ordinarily, under this scheme, the cattle are dispatched alive to the abattoir at the carcass-grading centre (London or Birmingham) and the consignor receives payment for the dead weight according to grade at prices previously quoted by the salesman. For the purpose of this demonstration, however, the cattle were slaughtered at Barnstaple and the carcasses were dispatched to a London salesman who had given forward quotations on a dead-weight basis for the three grades. Ten cattle were provided for the demonstration by six local feeders. The cattle were collected by lorry from the various farms on Thursday, January 26. After the live weights had been recorded, the cattle were slaughtered on January 27 and graded by the Ministry's official grader, four being graded "Select," five "Prime" and one "Good." The carcasses were then sent to Smithfield Market and the consignors received payment at the agreed price, according to grade, less the normal cost of sending the live animals to London by rail and 1s. per beast insurance.

The following table shows the outcome of the transactions to the consignors of the animals :—

Grade	No. of cattle	Total dead weight (8 lb. stone)	Price per stone (dead weight)	Net proceeds after deducting carriage and insurance (13s. 10d. per beast)
		st. lb.	s. d.	£ s. d.
" Select "	4	398 5	5 6	93 2 1
" Prime "	5	414 2	5 0	100 2 0
" Good "	1	85 7	4 8	19 6 11
Total ..	10	848 6	—	£212 11 0

The demonstration aroused considerable interest, and farmers and others attended from a wide area, including Cornwall.

National Mark Cauliflower and Broccoli.—A demonstration of the new National Mark schemes for cauliflower and broccoli and cabbage lettuce will be staged by the Ministry at the Western Commercial Horticultural Show, to be held at Penzance on March 16–17.

Displays of National Mark and other Home Produce.—In conjunction with a local committee formed for the purpose, the Ministry is organizing a National Mark Shopping Week to be held in Ipswich from March 6 to 11. One feature of the week will be an exhibition of National Mark and other home produce in the Public Hall, Ipswich. In addition to the Ministry's own exhibit of all National Mark products in season, a number of National Mark packers have taken stands, and local industries will also be represented. A working demonstration of the grading and packing of eggs under the National Mark Scheme, and a cookery demonstration with National Mark flour and other commodities, will be among the attractions.

The exhibition, which will be opened by Earl De La Warr, Parliamentary Secretary to the Ministry, on the afternoon of March 6, will be the most comprehensive National Mark display yet held.

Publicity for National Mark Products.—In view of the success that attended the National Mark eggs window-

dressings competition held in London in April, 1932, another competition, open to all retailers of eggs in the London Postal Area, has been arranged for the week March 6-11. Similar competitions will be held in Birmingham, March 20-25, and in Leeds, March 27-April 1. In each case, cash prizes and diplomas for the best window displays are offered.

The Ministry has leased the Empire Marketing Board's advertising frames in London, Manchester, Birmingham and a large number of other towns in important consuming areas for the display, during the three weeks March 2-23, of a new poster-set featuring National Mark eggs, flour and canned fruit. Supplementary publicity for National Mark canned fruits and vegetables is being given by means of a short series of advertisements in certain of the London newspapers having a national circulation.

Announcements with regard to the introduction of the new National Mark schemes for cauliflower and broccoli, and cabbage lettuce, respectively, are being made in the advertisement columns of certain journals circulating generally amongst growers, and also in a limited number of newspapers published in four or five of the principal growing areas. Publicity to these schemes is also being given by means of two leaflets—Marketing Leaflets Nos. 34a and 34b—addressed to growers and distributors, respectively, and by a poster suitable for display in markets and other places. Copies of the leaflets and of the poster may be obtained free of charge on application to the Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W. 1.

Report of the Reorganization Commission for Milk.—The Reorganization Commission for Milk, which was appointed in April last under the chairmanship of Sir Edward Grigg, has completed its investigations and its Report* has been issued by the Ministry of Agriculture and Fisheries as one of its series of "Orange Books" on agricultural marketing.

The Commission was constituted under the Agricultural Marketing Act, 1931, and by its terms of reference it was charged with the duties of preparing a scheme under the Act for regulating the marketing of milk in England and Wales, and of investigating any matters affecting the operation of the scheme.

* *Report of the Reorganization Commission for Milk*, Economic Series No. 38, obtainable from His Majesty's Stationery Office, or through any bookseller, price 6d. net, post free 10d.

The Report contains much historical and statistical material relating to the milk industry of general interest, notably in regard to the position of the producing, distributing and manufacturing sections of the industry and of the consumer, the situation with regard to imports of milk and milk products, the law as it affects milk, and the history of milk marketing since the collective bargaining system was introduced some ten years ago. This information forms a useful background for the Commission's recommendations, which cover a wide field.

The plan of organization recommended by the Commission covers the producing, distributing and manufacturing sides of the industry. So far as producers are concerned, it is suggested that the scheme under the Agricultural Marketing Act should be administered by a *Central Producers' Board* with the advice and assistance of Regional Committees. In order that the Board may be in a strong position *vis-à-vis* other sections of the industry and may be able to rationalize the flow of milk supplies, the Commission proposes that the Board should become the technical owner of all milk other than that sold by producer-retailers, although it will not normally be necessary in practice to interrupt the ordinary relations between the producer and his buyer.

Complementary to the organization of producers, the Commission recommends the establishment of a *Central Dairymen's and Manufacturers' Board*, also with Regional Committees. This Board should include representatives of the existing wholesale and retail distributors' organizations, the consumers' co-operative movement, and organizations of manufacturers (including any milk-product marketing boards set up under the Agricultural Marketing Act).

The Commission suggests that a joint organization is necessary to give a statutory basis to the relations of the Producers' and Dairymen's Boards and to provide for matters of common interest to the whole industry. It accordingly recommends the establishment of a statutory *Joint Milk Council* comprising these two Boards together with three impartial members. One of the main functions of the Council would be to negotiate and fix from time to time the prices for milk for liquid consumption and for manufacture.

Contract prices for milk consigned to the liquid market would be determined for each region and it is proposed that distributors who buy milk for sale outside the producing region should be required to pay the price of the region in

which the milk is to be sold by them or that of the region in which it is produced, whichever is the higher. The provisions of the scheme would ensure adherence to the prices fixed by the Council and would prevent under-cutting. It is recommended that the prices of milk consigned to manufacture should be fixed by the Joint Milk Council on the basis of the realization value of the milk when manufactured, allowance being made for butter-fat content.

The price policy recommended by the Commission provides for the distribution of sales proceeds to producers on the basis of regional pools. In order to compensate to some extent those regions in which the proportion of milk consigned to manufacture is high and where the regional pool price would accordingly be comparatively low, it is proposed that a levy should be raised on all sales of milk for liquid consumption, including sales by producer-retailers, and that the proceeds of this levy should be allocated to the regional pools in the summer months in proportion to the quantity of manufacturing milk produced in the several regions.

Individual producers are to be credited with any premiums secured from buyers for graded milk, level deliveries, and any special services.

The Commission considers that the inclusion of producer-retailers is essential to any scheme that seeks to establish a fair balance between sellers of milk for liquid consumption and for manufacturers, and is also in their own interests. The conditions on which it is suggested that they should participate are such that they will contribute on much the same terms as other producers selling for liquid consumption. Producer-retailers would operate under licences granted by the Producers' Board.

The Commission considers that the present statutory arrangements for the grading of milk are complicated and confusing. It is suggested that the grades should be reduced to one, namely, a "Special" grade, which would be milk produced under the same conditions as those now prescribed for Grade A (Tuberculin Tested) milk. The present Grade A should, however, be continued for a further period of, say, two years.

Pasteurization should be subject to strict official control and re-pasteurization should be prohibited. The Commission is unable to pronounce on the merits of pasteurization, but considers that producers will have difficulty in resisting the growing movement for compulsory pasteurization unless steps

are taken to improve the quality of raw milk supplies generally.

As one way of encouraging a higher standard of production, the Commission recommends that producers who comply with certain conditions regarding their herds, buildings, methods of production and handling of milk, and the bacterial content of their milk, should receive a guaranteed quality premium. The premium should be fixed by the Joint Milk Council and paid out of a fund raised by a levy on all sales of milk, one half of the levy being paid by producers and the other by buyers (i.e., distributors and manufacturers). Milk falling below a minimum standard of cleanliness and bacterial content should be subjected to a penalty.

The Commission attaches some importance to the more uniform and effective administration of the Milk and Dairies Order, and also recommends the introduction of compulsory routine clinical examination of all dairy cattle. The establishment of a whole-time veterinary service by County and County Borough Councils is considered essential, and it is recommended that assistance should be given to such a service out of State funds.

Practical encouragement of the manufacture of milk products is included in the main objects of a ry scheme of reorganization, and the Commission considers that its proposals will in practice prove favourable to the development of manufacture as a primary industry and not merely as an adjunct to the liquid-milk trade. If the industry is to be placed on a permanent basis, however, efficiency in the production of manufacturing milk and in the manufacture and marketing of milk products is essential.

Investigations into the possibilities of certain measures for improving the manufacture and marketing of butter and cheese are suggested, and the Commission recommends that attention should be given to the question of standards for cream and ice-cream. In the expansion of the trade in these latter products, and particularly in the development of a trade in cream of a low butter-fat standard, rest considerable possibilities.

Substantial increases in the present Customs duties on cream, condensed whole milk, milk powder and lactose are recommended. In the case of butter and cheese, the home industry would derive little benefit from the imposition of higher duties, but the Commission suggests that the regulation of supplies in the interests of exporting countries as well as of the home industry may become desirable.

As regards condensed skimmed milk, imports of which have increased remarkably in recent years, the Commission hesitates to recommend such a duty as would be necessary to secure an expansion of home production, but suggests that measures to encourage home supplies might be considered as economic conditions improve and the manufacture of cream develops. The development of the pig industry should, however, provide an outlet for skimmed milk more remunerative than condensing the milk.

The Commission pays tribute to the enterprise, research and skill in management that have been brought to the distribution of milk, but, largely owing to the special demands of consumers, the service rendered by many distributors is considered to be unnecessarily costly.

The general effect on the distributive trade of the Commission's proposals should be to secure improvements in organization and the elimination of wasteful effort, to the benefit not only of distributors but of producers and consumers.

Schemes Regulating the Marketing of Pigs and Bacon.—A scheme under the Agricultural Marketing Act, 1931, for the regulation of the marketing of pigs in Great Britain has been submitted to the Minister and the Secretary of State for Scotland. A parallel scheme for the regulation of the marketing of bacon has also been submitted. Copies of the schemes (price 6d. per copy, post free) may be obtained from the National Farmers' Union, 45 Bedford Square, London, W.C. 1, and the Food Manufacturers' Federation, 22 Buckingham Gate, London, S.W. 1. respectively. Notice of submission of the schemes was published, in accordance with the requirements of Section 1 (3) of the Act, in the *London Gazette* of January 20, 1933, in the case of the pigs scheme, and January 24, 1933, in the case of the bacon scheme. Both schemes are based on the recommendations of the Reorganization Commission for Pigs and Pig Products.*

Wheat Act, 1932.—The Wheat Commission have recently made two decisions that are of particular importance to wheat growers.

The first is intended to strengthen the requirements as to what is satisfactory proof of the facts concerning a sale of wheat by a grower and of its dispatch from the farm. For

* Economic Series No. 37, obtainable from His Majesty's Stationery Office, or through any bookseller, price 6d. net, post free 8d.

this purpose, the Commission have made a new by-law, which has been approved by the Minister. This provides that an authorized merchant must be satisfied, before issuing a wheat certificate, that the wheat in question has been dispatched from the farm on delivery to, or to the order of, the buyer named in the certificate (whether miller, merchant or farmer), and that *none of it was so dispatched for the purpose of being redelivered to the person who sold it.*

The effect of the new by-law is that it is no longer permissible for an authorized merchant to issue a wheat certificate in any case where the grower offers wheat for sale subject to an arrangement for the wheat to be redelivered to him after a few days' storage away from the farm. *A grower who wishes to use or consume on his farm millable wheat grown by himself must be prepared to forgo deficiency payments for that wheat.* In order to secure the deficiency payment under the Wheat Act, the grower must sell the wheat and dispatch it from his farm, free from any arrangement for its redelivery to himself. Of course, the grower will continue to be free, as hitherto, to buy other wheat for use on his farm.

The second decision deals with the interpretation of the statutory definition of millable wheat.* There is some uncertainty as to the procedure to be followed in cases where wheat does not conform with the definition. The Commission have, therefore, issued to all authorized merchants a circular letter which emphasizes the point that a wheat certificate may be issued only if the wheat in question is, *before sale*, certifiable as millable wheat. Cases occur where wheat submitted to an authorized merchant contains too much admixture or moisture to satisfy the definition, but can be rendered "millable wheat" by processes of cleaning or conditioning. In such cases, the proper course is for the grower to apply to the Commission, *before he sells the wheat*, for a permit to remove it from the farm for the necessary treatment, if he is unable to clean or treat the wheat on his own farm. A form of application for a permit can be obtained from any authorized merchant.

Any grower who feels the least doubt as to whether wheat

*The Wheat (Definition of Millable Wheat) Regulations, 1932, define millable wheat as "wheat which is sweet and in fair merchantable condition, commercially clean as regards admixture and tailings, and commercially free from heated or mouldy grains or objectionable taint, and capable of being manufactured into a sound and sweet flour fit for human consumption having regard to the customary methods employed in the milling industry for cleaning and conditioning wheat." (*Statutory Rules and Orders*, 1932, No. 559.)

that he proposes to sell complies with the definition of "millable wheat" is strongly advised to consult an authorized merchant *before he effects a sale*. The names of local authorized merchants can be obtained from the County Secretary of the National Farmers' Union, or from the County Secretary of the National Association of Corn and Agricultural Merchants.

Production of Home-grown Beet Sugar.—The quantities of beet sugar manufactured during January, 1933, and in the corresponding month of 1932 were :—

	cwt.
January, 1933	538,776
January, 1932	99,265

The aggregate outputs of sugar during the two manufacturing campaigns to the end of January were :—

	cwt.
1932-33	6,605,803
1931-32	5,027,666

The 1932-3 campaign has now closed, and the following figures (which must be regarded as provisional) briefly indicate the results. The corresponding figures for the 1931-32 campaign are given for comparison.

		1932-1933	1931-1932
Beet area	<i>Acres</i>	255,648	234,174
Quantity of beet delivered	<i>Tons</i>	2,232,000	1,667,288
Yield per acre	<i>Tons</i>	8·7	7·1
Sugar content	<i>Per cent.</i>	16·9	17·3
Sugar produced	<i>Cwt.</i>	6,605,803	5,027,666
Molasses produced	<i>Cwt.</i>	1,560,000	1,063,479
Sugar extraction on beets	<i>Per cent.</i>	14·7	15·1
Molasses „ „	<i>Per cent.</i>	3·5	3·2

The sugar-content was below average, but the beet yield of 8·7 tons per acre almost equals the highest so far recorded, viz., 8·8 tons in the 1930-31 campaign.

Anticipated Supply of Home-grown Millable Wheat.—Under Section 2 (4) of the Wheat Act, the Minister is required to prescribe by Order, at the beginning of the cereal year, the quantity of millable wheat of their own growing which he anticipates will be sold by registered wheat growers during the year. The estimate may be varied by subsequent Order made before January 31 following, in order that account may be taken of the results of the harvest.

By an Order made by the Minister on June 16 last, the "anticipated supply" is estimated at 19,800,000 cwt. The Wheat Commission have considered whether the estimate

should be varied, but they have come to the decision, in which the Minister concurs, not to recommend any alteration.

Certificates received by the Wheat Commission from registered growers up to February 10 covered 12,421,007 cwt. of millable wheat sold at the average price per cwt. (at farm) of 5s. 4d.

MARCH ON THE FARM

WILLIAM LAWSON, M.B.E., N.D.A., N.D.D.,

Director of Agriculture for West Sussex.

Weather.—The success of arable land crops is very much dependent on the weather that prevails at this season of the year. Cereal crops sown early on a satisfactory seedbed are assured of a good start. Rainfall has been fairly normal since October, but the excessive rain in that month did much to create the soft, muddy conditions that have been so prevalent during the past winter.

The frost during January was a welcome change, and although it created trouble with water-pipes, it provided dry, clean conditions for some very necessary carting.

Arable Land.—The sowing of spring cereals is now the most important work on hand, and, when conditions permit, attention should be given to the land that is intended for root crops so that it may be made suitable in condition for sowing at the right time. Land intended for bare fallow can wait a little longer, as there is no need to create a tilth.

Fallow Land.—The term "fallow" is commonly used to cover the part of the rotation in which the soil is freely and frequently cultivated over a prolonged period in order to destroy weeds, improve its mechanical condition and increase its fertility. The fact that cereals reduce the fertility of the soil has been well known from very ancient times. The "rest" ordered by the Mosaic Law to be given to the land every seventh year indicates this.

Virgil in the first century B.C. stressed the need for fallows. He states in effect that land should lie fallow every other year, or that cereals should follow such crops as vetches or lupins. In the cultivation of fallows, Virgil says the land should be twice ploughed in winter and twice in summer.

The alternative to fallows lies in the abandonment of land when it becomes exhausted, and the breaking up of fresh land—

a policy that is only practicable where the population is sparse and suitable fresh land is abundant.

Even in very early times, the cultivated land of England was kept in use by means of a rotation of crops based on the growth of cereals and pulses and the leaving of the land fallow for a year.

The cropped fallow is a comparatively modern practice. The introduction of drill husbandry, and of crops suitable for sowing somewhat late in spring, has removed the necessity for a bare fallow on all medium and light-textured soils. Crops suitable for the fallow year admit of further cultivation during the early growth, and at the same time add materially to the produce obtained from the soil in the course of the rotation.

The work done at Rothamsted since 1845 has indicated how cereals may be grown fairly successfully and continuously on the same land. The exhaustion factor can be avoided by suitable manuring, but the difficulties of weed control make such a system impracticable on a large scale. A rotation is essential to economical arable farming, and whilst this can be more flexible than in early times, the principles so long recognized still apply and the fallow year has an important influence on the other crops in the rotation.

On heavy soils, with a dry climate, where roots are uncertain, difficult and expensive to cultivate, the bare fallow still persists and is justified. On light soils a cropped fallow is more beneficial; it prevents waste of organic matter and at the same time provides stock food that in turn can be consumed by sheep on the land, which is thus manured. Under modern conditions the heavy costs of growing a cropped fallow present a serious problem.

The selection of the crop to be grown depends upon the nature of the soil, the climate, the position as to markets and the general system of farming practised. A brief review of the principal root crops may be of some interest at this season.

The Potato.—The potato is grown very generally and succeeds on a wide variety of soils. The farm lands in the British Isles are capable of producing potatoes in excess of the requirements for domestic home consumption.

As a commercial crop, potatoes are cultivated in certain districts to such an extent that they are the controlling factor in the farming system. In parts of Lincolnshire, the Isle of Ely and in Lancashire potato growing practically dominates the system of farming practised on many holdings. Soils

containing a large amount of organic matter produce the heaviest crops, but the quality is inferior to the produce of sandstone and silt soils. Soils deficient in lime can grow heavy crops.

Potatoes are expensive to cultivate, the "seed" and manuring being more costly than with any other common farm crop. The "seed" must be carefully selected. In England change of "seed" is important, and the farther south the crop is grown the more frequent the need of change. Deterioration of the potato is now known to be due to virus diseases such as Leaf Curl, etc., and these are much more prevalent in southern districts.

Sprouting the seed is an advantage. This is done in boxes or trays, the object being to obtain short, thick sprouts about one inch long, which is brought about by careful control of heat and light. A dark situation produces a long thin sprout, and to get good results care should be taken fully to expose the sets to light after sprouting has commenced.

Potatoes succeed well after a ley, the decaying turf providing the organic matter so beneficial to the growth of the crop. Cultivation should be deep and thorough,—but a particularly fine tilth is not essential.

Manuring should be liberal and balanced to suit the type and condition of soil. Growers should ascertain the results of local experiments, both as to varieties and manuring.

The advantages of the potato crop are that it is a splendid cleaning crop, and is a cash crop that can be sold without further conversion. On the other hand, as already indicated, it is possible to grow more potatoes than are required, and prices are apt to drop below the cost of production in certain years.

Sugar-beet.—This crop has been cultivated on the Continent on a large scale for over a hundred years. In England, it has assumed importance only within the past ten years, and the area grown is now about three-quarters of that devoted to potatoes.

It is suited to a wide range of soils, but does not succeed in soils deficient in lime, and on light shallow soils the yield is low, while on very heavy soils cultivations are more expensive, and the high dirt tare adds to the cost of freight charges.

The distribution of the crop is mainly determined by the proximity to a beet-sugar factory. Good yields are obtained

in the south and west, but the distance from a factory has prevented its more extensive cultivation. It has advantages over the potato crop as the farmer grows on a contract at a stipulated price, and he knows that the heavier the crop and the higher the sugar content, the greater is the money value per acre.

It is also a cash crop, but in addition it provides valuable stock food in the tops that are left on the farm and the dried beet pulp that is available from the factory.

The sugar-beet is an excellent cleaning crop; it repays deep and thorough cultivation; and it leaves the land better fitted to grow the following crops in the rotation. No other crop available to the farmer better combines a cash income, valuable stock food and improved condition of soil. The average yield is as yet not so high in England as that obtained in some countries on the Continent, but there is no reason to doubt the suitability of the crop for English soils and climate, at any rate in the area south of York.

The cultivations required are similar to those for the mangold crop. Reasonably clean land is more important for sugar-beet than for mangolds or swedes, as narrower drills and a greater number of plants per acre are essential to a heavy yield, and this somewhat limits the facilities for cleaning whilst the crop is growing.

Deep ploughing and cultivation are beneficial. The land should be in good manurial condition, and it is an ideal crop for land in high condition. Farmyard manure should be ploughed in early, and well rotted. A good surface tilth should be obtained, and the soil should be fairly firm at seeding time.

The size of the crop is dependent on a uniform distribution of plants, and a liberal seeding of from 15 to 20 lb. of seed per acre is necessary.

Artificial manures should be complete, balanced, and in amount to suit the type and condition of the soil. Such manures should be applied before seeding, and should be well worked into the soil.

Mangolds.—In midland and southern counties mangolds grow well, and succeed best in a moderately dry and warm summer. Mangolds are a good cleaning crop, and are generally grown in the fallow year of the rotation. On some farms where the area of arable land is limited it is not unusual to grow mangolds on the same land for several years in succession.

The area under this crop has declined in recent years, possibly owing to the high cost of labour and to the substitution of other crops. In some quarters the value of mangolds as a food for dairy cows has been questioned, but where they can be grown and fed to stock at a low cost per lb. of starch equivalent, and are used in a practical way, there is no evidence to justify the abandonment of this crop. The main considerations are cost of production, and whether some other crop can be substituted to serve the purposes of the farmer and give better monetary returns.

Marrow-Stem Kale.—This crop is becoming increasingly appreciated. It produces an enormous quantity of rich, green produce; it can be produced at comparatively low cost; and it is a most effective cleaning crop.

In the south, the green-stemmed variety is more popular than the purple-stemmed variety, as it produces heavier crops; it is sufficiently hardy to stand the average winter, and is good till February. Sowings from mid-April to late June will provide a source of green food from September to February.

This crop is subject to attack by the Turnip Fly, but otherwise gives little trouble. Seed is sown at the rate of from 3 to 4 lb. per acre, in drills varying from 20 to 30 in. in width.

There is some difference of opinion as to whether the crop should be carefully singled. Where the crop is to be cut and carted from the field and used for cattle, the larger plants obtained by singling from 8 to 12 in. apart would appear to be desirable. If, however, the crop is designed for sheep feed, less accurate singling is justified, and bunching or merely harrowing across will provide the type of growth more relished by sheep.

Poultry keepers who confine their birds in more or less close quarters, and are short of green food in winter, will find marrow-stem kale suitable, and if split through the middle of the stem the birds will eat every part except the hard exterior or shell. The crop requires a soil well supplied with lime, and to get a heavy crop it should be liberally manured both with farmyard manure and complete artificials. The crop takes a good deal out of the land, and if it is cut and carted off the succeeding crop will suffer unless adequate manure is returned to the soil.

NOTES ON MANURES

H. V. GARNER, M.A., B.Sc.,

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Early Nitrogen for Barley.—One of the causes of poor malting quality in barley is a supply of nitrogen late in the life of the plant. This occurs when farmyard manure or heavy folding is given, and also if top-dressings of active nitrogenous fertilizers are applied late in the season. The crop takes up the nitrate at a time when its opportunity to make a compensating amount of starch is restricted. The result is high nitrogen in the grain. It is best to apply the nitrogen for barley a few days before sowing if cyanamide is used; in the seed bed along with the other manures if sulphate of ammonia is chosen; or as very early top-dressings when nitrochalk or any other nitrate is the form preferred. In experiments carried out under the research scheme of the Institute of Brewing even nitrate of soda applied at sowing time has been quite effective, but on open soils there is perhaps some risk of loss if wet weather sets in. In general, nitrogen should not be given after April.

Early sowing in itself is beneficial to yield provided that soil conditions are suitable, and experiments conducted at Rothamsted in the past season showed that nitrogen applied to the early-sown barley was more effective than the same amount of nitrogen applied to the late-sown barley. The nitrogen was applied just before drilling in each case. The figures were:—

Mean of Three Varieties. Cwt. per acre

		Grain	Straw
Sown early (March 5)	..	25.8	25.7
Sown late (April 6)	..	22.6	26.6

The early-sown barley gave significantly more grain, but only about the same amount of straw as the late-sown.

The nitrogen effect came out as follows:—

	<i>Yield. Cwt. per acre</i>			
	<i>Early-Sown</i>		<i>Late-Sown</i>	
	Grain	Straw	Grain	Straw
No nitrogen	23.7	23.7	21.6	25.1
1 cwt. sulphate of ammonia	27.8	27.7	23.5	28.2
Gain due to nitrogen ..	4.1	4.0	1.9	3.1

The better result obtained with nitrogen on the early sowings is significant for the grain, there being an advantage of 2.2 cwt. in favour of the early sowing. The combined effect of the two favourable circumstances, early sowing and early nitrogen, has been to give an increase of 6.2 cwt. grain or about 13 bushels per acre. The straw gave an increase of

2.6 cwt. and was not affected to the same extent. This is a valuable result, as it is only too easy to increase the amount of straw without a corresponding gain in corn.

Nitrate of Potash.—In the market garden districts this compound is finding considerable use as a fertilizer, and has received favourable mention from growers. It is said to promote early maturity, quality, and freedom from disease in the crops. The commercial grade contains about 95 per cent. of pure potassium nitrate, with 13.6 per cent. of nitrogen and 44.1 per cent. of potash. It is, therefore, rather concentrated, one hundredweight being about equivalent in plant food content to 100 lb. of nitrate of soda plus 100 lb. sulphate of potash. Growers who might otherwise use either nitrogen only or potash only must, if they employ nitrate of potash, give the constituents in approximately the ratio which is necessary to reap full advantage from either. Whether the same kind of result could be obtained from home-made mixtures of nitrate of soda with sulphate of potash does not appear to have been critically tested in this country, but this is perhaps a point worth examination.

The 95 per cent. grade of nitrate of potash is a synthetic product, but there are other grades, derived from the Chilean nitrate industry, that contain varying proportions of nitrate of soda. A common grade contains about 37 per cent. of nitrate of potash and 60 per cent. of nitrate of soda, giving 17 per cent. of potash (K_2O) and 15 per cent. of nitrogen. One hundredweight of this material has about the same content of plant nutrients as 1 cwt. low grade potash salts and 1 cwt. nitrate of soda. In these mixed nitrates the ratio of nitrogen to potash is higher than in the nearly pure salt, and may in certain circumstances be more suitable for soils already rich in potash.

In market garden practice, nitrogen and potash are the leading manurial requirements, and any fertilizer that contains them both in a readily available form meets a definite need. The high level at which market gardening is carried on, involving much larger doses of artificials than are given in ordinary farming, also favours the use of a concentrated manure.

Nitrate of potash is also made on an extensive scale in Germany by the action of synthetic nitrogen compounds on purified potash salts. It is the driest of the nitrates used for fertilizer purposes, and is, therefore, more suited for com-

pound manures, particularly those of a concentrated nature such as are employed in horticultural work.

A Mixture for Potatoes.—There are many areas in which a normal mixture for potatoes in conjunction with farmyard manure is on the following lines :—

- 1 cwt. sulphate of ammonia
- 4 „ superphosphate
- 1 „ sulphate of potash

Such a mixture may be adequate in districts well suited to the crop, but there is evidence that some increase of nitrogen and potash in relation to the phosphates is frequently desirable. This is likely to be so in the drier districts of the south, where the Rothamsted experiments give some guide as to the type of balance required. The following potato fertilizer is worth a trial in conjunction with farmyard manure when it appears probable that the crop will respond to something more generous than the normal dressing :—

- 2 to 3 cwt. sulphate of ammonia
- 4 cwt. superphosphate
- 2 cwt. sulphate of potash

An addition of about 10 per cent. of steamed bone flour is helpful in home-made mixtures as they then run more easily through the drill ; there is also the manurial value of the insoluble phosphate which probably comes in rather for subsequent crops than for the potatoes themselves.

The analysis of the above mixture (without the bone flour) is approximately 6 per cent. nitrogen, $7\frac{1}{2}$ per cent. soluble phosphoric acid, $11\frac{1}{4}$ per cent. potash. The ratio of plant nutrients is, therefore, approximately 1 part nitrogen to $1\frac{1}{4}$ parts soluble phosphoric acid to 2 parts potash.

It is not essential to make up the mixture at home if time is pressing in the spring. A compound fertilizer containing the plant nutrients in approximately the same proportion would be equally suitable, provided that the potash was largely in the form of sulphate. Exact equivalence in analysis is not of vital importance, for a small difference in any of the constituents is not likely to have a serious effect on the action of the manure.

When dung is not used the quantity of mixture given per acre might be increased by about one-third.

If the factory-made mixture, while of similar balance, is widely different from the above in concentration, that is to say in the actual amounts of N, P_2O_5 and K_2O present per ton, then this must be allowed for by a suitable adjustment of the dressing per acre.

Early Potatoes.—The highly-specialized art of growing early potatoes has been much less closely investigated in the matter of manuring than has been the case with main crops. As with all crops of high value per acre the tendency is to leave nothing to chance and farm at a very high level. Moreover, the same fields usually grow earlies at frequent intervals, and are, therefore, built up into more than ordinary fertility.

It is usually the very early-lifted crops that give the best returns, so that full growth is not nearly attained. The following figures illustrate this point :—

*Yield of Early Potatoes Harvested at Different Dates.
Tons per acre*

Date of lifting			Reaseheath, Cheshire, 1926	Ormskirk, Lancs, 1931	
				Dung	Dung + Artificial
June 30	..	..	3.4	—	—
July 2 ..	..	..	—	5.5	6.8
July 7 ..	..	..	5.7	—	—
July 14	..	..	7.5	—	—
July 19	..	..	—	9.3	12.4
July 21	..	..	9.0	—	—
July 28	..	..	11.4	—	—

A fortnight's extra growth in the beginning of June was almost sufficient to double the yield per acre.

Most growers tend to base their operations on farmyard manure, supplemented in coastal districts by sea-weed. The function of the organic manure is no doubt as much to secure favourable soil conditions as to provide plant food, for a check in growth due to drought, harsh tilth or similar cause is to be avoided at all costs. Although this manuring in itself would probably be enough for a useful crop of late potatoes, the earlies are provided with a generous mixture of artificials in which nitrogen and phosphate predominate. Nitrogen is regarded as the most active constituent, and is believed in some quarters to maintain the plant in growth during dry periods. On the other hand if a wet season follows, excess of nitrogen forces on a growth of haulm which may carry only a light crop of tubers. Part, at any rate, of the nitrogen is often supplied as nitrate of soda, which is sometimes reserved for an early top-dressing if the plant appears to be suffering a check. Phosphate is believed to hasten the crop to maturity. This action may have its drawbacks on certain soils on which the plant tends to finish very quickly, although it is valuable on the later soils.

Experiments in several districts have already raised some interesting points with regard to the 'management of the

crop. It is clear that no general scheme can be drawn up, as each area is governed by its own special conditions. The following examples show that when the manurial problems of areas have been critically examined, certain modifications suggest themselves. In the Cheshire district* there is evidence that the earliest-lifted crops require only moderate dressings of complete artificials in addition to farmyard manure. Heavier applications produced no better results, and the effect of artificials in general was much greater on the later-lifted crops.

The staff of the National Institute of Agricultural Botany,† working at Ormskirk in the S. Lancashire area, showed that definite and remunerative increases followed the application of 2 cwt. sulphate of ammonia, 3 cwt. superphosphate, and 1 cwt. sulphate of potash with 19 tons of dung. The figures are given in the table referred to above. Here again the increases in yield in the later-lifted section of the crop was much greater, but not necessarily more profitable.

In Lincolnshire the Kirton‡ workers have demonstrated that on the silt soils, where potatoes are frequently grown without dung, the potash in the mixture takes on greater importance; and the nitrogen and potash constituents may well be raised in relation to the phosphate.

Preliminary experiments have been started in the Bedfordshire area by the Rothamsted staff. In 1931, four levels of phosphate were examined, and a comparison between nitrate of soda and sulphate of ammonia was made. The phosphate had no pronounced effect, but the nitrate was definitely better than the sulphate. A further experiment gave some indication that top-dressing with nitrate was more effective than seed-bed application. In these trials the effect of the nitrogenous manures on the haulm was most noticeable, but the effect on yield was only slight; probably the crop was lifted before the tubers had time to benefit. In 1932 all nutrients were tested in presence of dung on the same farm. Phosphate had no effect, potash exerted a slight benefit which was not quite significant, and again nitrate of soda produced a relatively large and certain effect. The above experiments show that the problem of manuring earlies is not yet completely solved, and as further information comes to hand from the various districts it may be possible to effect economies in the treatment of this crop.

* Mercer, W. B., and Carr, W. A. C., *Reaseheath Review*, Vol. III, p. 21.

† Parker, W. H., *Jour. Nat. Inst. Agric. Botany*, Vol. III, 1931, p. 104.

‡ *Kirton Guide to Expts.*, 1928.

PRICES OF ARTIFICIAL MANURES

Average price per ton during week
ended February 8.

Description	Bristol	Hull	L'pool	London	Cost per unit at London
	£ s.	£ s.	£ s.	£ s.	s. d.
Nitrate of soda (N. 15½%) ..	8 16d	8 16d	8 16d	8 16d	11 4
" " Granulated (N. 16%) ..	8 16d	8 16d	8 16d	8 16d	11 0
Nitrate of lime (N. 13%) ..	7 ..	7 ..	7 ..	7 5	11 2
Nitro-chalk (N. 15½%) ..	7 5d	7 5d	7 5d	7 5d	9 4
Sulphate of ammonia :—					
Neutral (N. 20·6%) ..	6 7d	6 7d	6 7d	6 7d	6 2
Calcium cyanamide (N. 20·6%)	7 0s	7 0s	7 0s	7 0s	6 10
Kainit (Pot. 14%) ..	3 10	3 5	3 2	3 7g	4 9 ^m
Potash salts (Pot. 30%) ..	5 13	5 10	5 7	5 11g	3 8
" (Pot. 20%) ..	4 1	3 17	3 14	3 19g	3 11
Muriate of potash (Pot. 50%) ..	10 9	10 2	9 15	10 5g	4 1
Sulphate " (Pot. 48%) ..	12 5	12 0	11 15	12 3g	5 1
Basic slag (P.A. 15½%)|| ..	2 10c	2 0c	..	2 6c	2 11
" (P.A. 14%)|| ..	2 6c	1 16c	1 16c	2 3c	3 1
Ground rock phosphate (P.A. 26-27½%)|| ..	2 5a	2 5a	2 2a	2 5a	1 8
Superphosphate (S.P.A. 16%) ..	3 2	..	3 4	2 16k	3 6
" (S.P.A. 13½%) ..	2 17	2 11	3 0	2 12k	3 10
Bone meal (N. 3¼%, P.A. 20¼%) ..	6 10	6 5	6 7f	6 7	..
Steamed bone-flour (N. ¼%, P.A. 27¼-29¼%) ..	5 15	5 2	5 2f	5 0	..

Abbreviations : N. = Nitrogen ; P.A. = Phosphoric Acid ; S.P.A. = Soluble Phosphoric Acid ;
Pot. = Potash.

* Prices are for not less than 6-ton lots, at purchaser's nearest railway station, unless otherwise stated. Unit values are calculated on carriage paid price.

‡ Prices are for not less than 2-ton lots, net cash for prompt delivery f.o.r. in town named, unless otherwise stated. Unit values are calculated on f.o.r. price.

‡ Fineness 85% through standard sieve.

s Prices for 4-ton lots f.o.r.

e Prices for 6-ton lots. At Bristol, f.o.r. Bridgwater ; at Hull and Liverpool, f.o.r. neighbouring works, and at London f.o.r. depots in London district.

d For lots of 4 tons and under 6 tons the price is 1s. per ton extra, for lots of 2 tons and under 4 tons 5s. per ton extra, and for lots of 1 ton and under 2 tons 10s. extra.

e Delivered in 4-ton lots at purchaser's nearest railway station. For lots of 2 tons and under 4 tons the price is 5s. per ton extra, for lots of 1 ton and under 2 tons 10s. per ton extra and for lots of 10 cwt. and under 1 ton 15s. extra.

f Prices shown are f.o.r. Widnes.

g Prices shown are f.o.r. northern rails ; southern rails, 2s. 6d. extra.

h Prices shown are f.o.r. northern rails ; southern rails, 1s. 3d. extra.

NOTES ON FEEDING

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Prevention of Anaemia in Little Pigs by Feeding.—Judging by the number of inquiries that have been received, and by information communicated by pig breeders, it is evident that serious losses are occurring throughout the country amongst suckling pigs. It is recognized that treatment of disease is really the province of the veterinary surgeon, but there is reason to believe that proper nutrition plays a very great part in preventing disease. In several continental countries pig diseases are receiving much attention; for example, in the two years, April, 1929, to March, 1931, in Germany, 11,000 specimens of carcasses of little pigs were subjected to post-mortem examination. It was found that in the majority of these cases the diseases were not of bacterial origin, and those responsible for the report—Professor Messner and Dr. Kreser—comment on the decreasing importance of the bacteriological factor, and the increasing importance of dietetics and hygiene in the aetiology of disease.

It is generally recognized that gross dietetic errors and sudden changes in rations give rise to nutritional troubles, but even those who endeavour to feed their pigs on rations balanced as correctly as possible, and devote real care to methods of feeding, sometimes fail to avoid losses in their litters. These losses are most commonly attributed to anaemia and diarrhoea.

The occurrence of diarrhoea, scour, or dysentery in little pigs appears to be widespread, and there seems to be reason to believe that in certain cases it may be due to infection with a coliform bacillus. In dealing with scour of this type, the veterinary officer attached to this Institute has had success with a serum inoculation. From the nutritional point of view, however, it is with the prevention of anaemia and the secondary diseases apparently arising from anaemia that we are primarily concerned here. In this connexion the report on *Studies on Nutritional Anaemia in Suckling Pigs*, by Mr. Vald. Adersen of the State Veterinary Laboratory, Copenhagen, is of great value to British pig-keepers. Of the earlier literature dealing with investigations made in recent years relative to this disease there is notably that of McGowan and Crighton.

It has been demonstrated that when suckling pigs are kept indoors, without access to the open and to earth, and are

nourished exclusively on their mother's milk, the haemoglobin value of the blood gradually falls so that there may be pronounced anaemia by the time the pigs are about three weeks old; and that the anaemic condition is a contributory cause of disease and death, although death may actually result from various secondary causes. McGowan and Crighton found that mortality and lack of ability to thrive could be checked by giving the little pigs iron oxide.

Adersen has been associated with his veterinary colleague, Jorgensen, in studying anaemia and its prevention in a herd of pigs in Denmark. A large number of determinations of the haemoglobin values of the blood of little pigs were made at intervals of about a week, and demonstrated that when the pigs are kept indoors the haemoglobin content of the blood may fall in the first three weeks to within one-third of the content at birth, and that there is a more or less rapid rise in the haemoglobin content in the following weeks, the rise being affected by the extent to which the pigs have access to food other than their mother's milk. The investigations were carried out in a herd in which there had been mortality attributed to anaemia, and covered all the pigs born in the herd between December, 1930, and February, 1932—altogether 91 litters, totalling 907 pigs born alive. The litters were divided into groups and treated experimentally in different ways with the object of obtaining information regarding weight increases and mortality.

The pigs in certain of the litters were kept entirely indoors and given daily one teaspoonful of a 2.5 per cent. solution of ferrous sulphate. Other groups were allowed to go out of doors and others were treated as controls. At the outset some of the pigs were vaccinated with swine *Pasteurella* preparations, but this apparently gave no result. In one series of experiments pigs treated with ferrous sulphate and those allowed out of doors weighed on the average from 14.64 to 15.29 kg. at eight weeks old, whereas the average weight of the controls was under 11.5 kg. As regards mortality, the percentages of deaths amongst the pigs which received ferrous sulphate, and amongst those allowed to go out of doors, were very much smaller than amongst the controls. The number of non-iron-treated pigs kept indoors which died varied from about 30 to 60 per cent. in the various groups. Throughout the period of investigation mortality generally was highest amongst pigs born in the winter months, December to March.

The value of the ferrous sulphate and of "rooting" was clearly demonstrated, and because it proved rather an impracticable measure in a commercial herd to dose pigs daily with ferrous sulphate, a series of experiments was designed to find a more satisfactory form of treatment. Certain groups were given access daily to fresh earth obtained from arable land, and others were given various foods to which ferrous sulphate was added. The supplying of earth proved to be the most effective method; the little pigs began at once to "root" in the earth and eat it, with beneficial results.

The results generally showed the very striking significance of nutritional anaemia as a primary cause of mortality in little pigs. With regard to the symptoms of affected animals, sudden death occurred in only very few instances. In the majority of cases death did not occur until after the pigs had been very pale for some time, generally unthrifty in appearance, weak and short of breath. *Many had more or less severe diarrhoea*, and scaly skins were common in those ill for some time. It may be that herein lies the primary cause of much of the scour or diarrhoea that commonly starts in little pigs at about three weeks to a month old, and to which reference was made at the outset as a serious cause of loss in small pigs in herds in this country. It has been our experience that scour has disappeared when sows and litters have been taken from sties and turned out on fresh clean ground with some kind of comfortable, movable shelter.

It may be that this practice of turning sows and pigs out is of value for two reasons: (1) it allows the little pigs to root and obtain their required supply of iron from the natural source, and (2) where the particular form of scour is of bacterial origin, it removes the little pigs from conditions under which mass infection is most likely to take place. Actually, Adersen's work drives home to us the point that we should not forget that the pig is an animal that naturally "roots" and that, presumably, requires to "root" in order to satisfy its natural needs. Therefore, if we keep breeding sows in what are unnatural conditions in sties on concrete floors, they and their litters are deprived of a source of nutriment to which nature had intended that they should have access. If little pigs are to be allowed to root to obtain their supply of iron, it is essential that they should do so under hygienic conditions, in clean fresh earth, not in a foul muck heap. Rooting in contaminated yards amongst infected material is a fruitful cause of worm disease in young pigs.

It is clear that the nutritional anaemic condition may develop in all suckling pigs that have not access to the open air, or to "rooting," or that are not specially supplied with iron preparations, although the anaemia is not necessarily fatal. It is not, however, clear what the circumstances or the combinations of causes may be which enable the animal to pull through the anaemic period. Adersen suggests that hereditary characteristics may be of very great importance.

In this connexion one might draw the attention of those who are interested in promoting pig-recording schemes in this country to the fact that the Scandinavian pig-keeper attaches first importance to the weight and size of litter at three weeks old. In this country, schemes so far adopted have made provision for weighings at various ages, but, in almost every case, neglect the importance of weighing at three weeks old. There is no evidence from elsewhere that the Scandinavian practice is other than essentially sound as a guide in the selection of breeding stock; but if additional evidence of the value of weighing at three weeks old were required, it is indicated in the relationship of weight at this age to hereditary resistance to nutritional anaemia.

A final word of warning may be added. Pig keepers should not imagine that they will adequately supplement any sort of ration by the addition of an iron preparation, nor assume that if they allow their little pigs out of doors to root they will prevent or cure all cases of anaemia or scour. Certain other common-sense methods of feeding and management are essential—notably the feeding of pregnant and suckling sows with suitably balanced rations, adequately provided with sufficient protein of animal origin, minerals, and green food, as well as general cleanliness, sanitary conditions, and the provision of fresh air and sunlight.

* * * * *

DESCRIPTION	Price per ton	Manu- rial value per ton	Cost of food value per ton	Starch equiv. per 100 lb.	Price per unit starch equiv.	Price per lb. starch equiv.	Pro- tein equiv.
	£ s.	£ s.	£ s.		s. d.	d.	%
Wheat, British	5 8	0 10	4 18	72	1 4	0-71	9-8
Barley, British feeding ..	5 5	0 8	4 17	71	1 4	0-71	6-2
" Canadian No. 3 Western ..	6 5	0 8	5 17	71	1 8	0-89	6-2
" Danubian	5 12½	0 8	5 4	71	1 6	0-80	6-2
" Russian	6 2	0 8	5 14	71	1 7	0-85	6-2
Oats, English white	6 0	0 8	5 12	60	1 10	0-98	7-6
" black and grey	6 0	0 8	5 12	60	1 10	0-98	7-6
" Scotch white	7 0	0 8	6 12	60	2 2	1-16	7-6
" Canadian No. 2 Western ..	6 13	0 8	6 5	60	2 1	1-12	7-6
" No. 3	6 7	0 8	5 19	60	2 0	1-07	7-6
" mixed feed	5 5	0 8	4 17	60	1 7	0-85	7-6
" Argentine	5 13	0 8	5 5	60	1 9	0-94	7-6
" Chilean tawny	6 8½	0 8	6 0	60	2 0	1-07	7-6
" white	7 17½	0 8	7 9	60	2 6	1-34	7-6
Maize, Argentine	5 2	0 8	4 14	78	1 2	0-62	7-6
" Gal. Fox	4 15½	0 8	4 7	78	1 1	0-58	7-6
" Russian	4 13½	0 8	4 5	78	1 1	0-58	7-6
Beans, English winter	5 15½	0 19	4 16	66	1 5	0-76	19-7
Peas, Indian	9 10½	0 16	8 14	69	2 6	1-34	18-1
" Japanese	32 0½	0 16	31 4	69	9 1	4-87	18-1
Dari	8 0½	0 9	7 11	74	2 0	1-07	7-2
Milling offals—							
Bran, British	5 15	0 19	4 16	43	2 3	1-20	9-9
" broad	6 15	0 19	5 16	43	2 8	1-43	10
Middlings, fine imported ..	5 15	0 14	5 1	69	1 6	0-80	12-1
" coarse British	5 12	0 14	4 18	56	1 9	0-94	10-7
Pollards, imported	5 2	0 19	4 3	62	1 4	0-71	11
Meal, barley	7 15	0 8	7 7	71	2 1	1-12	6-2
" Grade II	7 0	0 8	6 12	71	1 10	0-98	6-2
" maize	5 12	0 8	5 4	78	1 4	0-71	7-6
" South African	5 5	0 8	4 17	78	1 3	0-67	7-6
" germ	6 0	0 13	5 7	79	1 4	0-71	8-5
" locust bean	6 12	0 6	6 6	71	1 9	0-94	3-6
" bean	8 0	0 19	7 1	66	1 9	0-94	19-7
" fish	14 10	2 14	11 16	59	4 0	2-14	53
Maize, gluten feed	6 5	0 14	5 11	76	1 6	0-80	19-2
" cooked flaked	6 10	0 8	6 2	84	1 5	0-76	9-2
Linseed cake, English, 12% oil ..	8 12	1 3	7 9	74	2 0	1-07	24-6
" " " 9% " ..	8 7	1 3	7 4	74	1 11	1-03	24-6
" " " 8% " ..	8 2	1 3	6 19	74	1 11	1-03	24-6
" " " 6% " ..	8 7½	1 3	7 4	74	1 11	1-03	24-6
Soya bean cake, 5½% oil ..	7 17½	1 11	6 6	69	1 10	0-98	36-9
Cottonseed cake—							
English, 4½% oil	6 2	1 3	4 19	42	2 4	1-25	17-3
Egyptian, 4½% oil	5 12	1 3	4 9	42	2 1	1-12	17-3
decorticated, 7% oil	7 10½	1 12	5 18	68	1 9	0-94	34-6
Cottonseed meal decorticated, 7% oil ..	7 10½	1 12	5 18	68	1 9	0-94	34-6
Coconut cake, 6% oil	6 15½	1 0	5 15	77	1 1	0-80	16-4
Ground-nut cake, 6-7% oil ..	7 15½	1 0	6 15	57	2 4	1-25	27-3
" decorticated, 6-7% oil ..	8 5	1 11	6 14	73	1 10	0-98	41-3
Palm-kernel cake, 4½-5½% oil ..	6½ 0½	0 13	5 7	73	1 6	0-80	16-9
" " meal, 4½% oil ..	6½ 0½	0 13	5 7	73	1 6	0-80	16-9
" " meal, 1-2% oil ..	5 12	0 14	4 18	71	1 5	0-76	16-5
Feeding treacle	5 0	0 9	4 11	51	1 9	0-94	2-7
Brewers' grains, dried ale ..	6 5	0 14	5 11	48	2 4	1-25	12-5
" " porter	5 15	0 14	5 1	48	2 1	1-12	12-5
Dried sugar-beet pulp (a) ..	5 10	0 7	5 3	60	1 7	0-85	5-2

† At Liverpool. ‡ At Hull. (a) Carriage paid in 4 ton lots.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of January, 1933, and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative values of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, if linseed cake is offered locally at £10 per ton, then since its manurial value is 28s. per ton as shown above, the food value per ton is £8 17s. Dividing this figure by 74, the starch equivalent of linseed cake as given in the table, the cost per unit of starch equivalent is 2s. 4d. Dividing this again by 25-4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1-20d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculation a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own markets. The figures given in the table under the heading manurial value per ton are calculated on the basis of the following unit prices:—N, 6s. 1d.; P₂O₅, 2s. 6d.; K₂O, 2s. 6d.

Farm Values.—The prices in respect of the feeding stuffs used as bases of comparison for the purposes of this month's calculations are as follows :—

	Starch equivalent Per cent.	Protein equivalent Per cent.	Per ton £ s.
Barley (imported)	71	6.2	6 0
Maize	78	7.6	4 17
Decorticated ground-nut cake ..	73	41.3	8 5
„ cotton cake	68	34.7	7 10

(Add 10s. per ton, in each case, for carriage.)*

The cost per unit starch equivalent works out at 1.43 shillings, and per unit protein equivalent, 1.76 shillings. An explanation of the method of calculation employed is given in the Report of the Departmental Committee on Rationing of Dairy Cows.*

The table is issued as a guide to farmers respecting the feeding value of their crops in relation to current market prices. (The “food values,” which it is recommended should be applied by Agricultural Organizers and other advisers in connexion with advisory schemes on the rationing of dairy cows, are given in the November, 1932, issue of the Ministry's JOURNAL, p. 781.)

FARM VALUES

CROPS	Starch equivalent Per cent.	Protein equivalent Per cent.	Food value per ton, on farm £ s.
Wheat	72	9.6	6 0
Oats	60	7.6	4 19
Barley	71	6.2	5 12
Potatoes	18	0.8	1 7
Swedes	7	0.7	0 11
Mangolds	7	0.4	0 11
Beans	66	19.7	6 9
Good meadow hay	37	4.6	3 1
Good oat straw	20	0.9	1 10
Good clover hay	38	7.0	3 7
Vetch and oat silage	13	1.6	1 1
Barley straw	23	0.7	1 14
Wheat straw	13	0.1	0 19
Bean straw	23	1.7	1 16

* Obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 6d. net.

MISCELLANEOUS NOTES

THE next series of eight Lectures and Demonstrations on Tropical Hygiene, intended for men and women, outside the medical profession, proceeding to the Lectures in Tropics, will be given by Lieut.-Colonel Tropical Hygiene G. E. F. Stammers, O.B.E., M.R.C.S., L.R.C.P., D.P.H., from March 6 to 15, 1933. These courses of instruction, in addition to providing simple rules for guidance in regard to personal hygiene and preparation for life in the Tropics, will also embrace a short account of some of the more common diseases, with advice in regard to measures of protection and self-treatment.

The synopsis and other particulars can be obtained from the Secretary, London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, London, W.C. 1.

* * * * *

THE trials which are arranged each year by the Ministry with the object of testing new varieties of potatoes for immunity from Wart Disease were again conducted in 1932 on the farm of the Trials of Potatoes for Immunity from Wart Disease, 1932 National Institute of Agricultural Botany, Ormskirk, Lancashire. The actual field operations and the taking of records were carried out by Mr. Harold Bryan, B.Sc., and Mrs. McDermott, of the Institute, but the trials were conducted on a plan approved by the Ministry.

Thirty stocks were included in the second and subsequent years' test, none of which developed Wart Disease. Of the 47 entries for the first year's tests, 9 became infected in the field; 8 proved to be synonyms of existing varieties; 1 was too poor to judge and 38 were distinct varieties.

As in previous years, the results of the trials have been considered by a small committee composed of representatives of the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland, and co-ordinated with the results of the trials carried out by the two last-named Departments at Philpstoun and Kilkeel respectively.

The Committee recommended the approval of 28 new varieties, but only 3 of these have actually been added to the approved list. In the remaining cases inclusion has been postponed until such time as the raisers have intimated that the varieties have actually been or will shortly be introduced into commerce. Descriptions are given below of the new

varieties, together with that of another variety which was approved as the result of trials carried out previously and which is now being introduced into commerce. A description of the variety "*Ranger*" (see this JOURNAL, May, 1932, p. 180) is also appended.

The variety "*Ballydoon*," which was originally described as a Second-Early (see this JOURNAL, March, 1931, p. 1271), will in future be classified as an Early variety,* the variety "*Ochiltree*" (see this JOURNAL, May, 1932, p. 181) has been renamed "*Gladstone*."

The findings of the Potato Synonym Committee of the National Institute of Agricultural Botany have been accepted by the Ministry where recommendations as to the classification of new varieties as synonymous with existing varieties have been made by that Committee.

A list of the names of the more commonly grown varieties which have been approved as immune from Wart Disease may be obtained on application to the Ministry.

EARLY VARIETIES

"Dunbar Yeoman"

<i>Sprout</i>	..	Pink.
<i>Tuber</i>	..	Thick oval to kidney; skin white; flesh pale yellow; eyes shallow.
<i>Haulm and Foliage</i>		Early type of top, vigorous, spreading; colour grey-green; leaflets medium size, soft appearance, laterals overlap terminal leaflet, very slightly waved edges, dull; secondary leaflets small; wings straight; stems with slight pink tinge towards maturity.
<i>Flowers</i>	..	None observed; buds drop.

"Early Exon"

<i>Sprout</i>	..	Pink.
<i>Tuber</i>	..	Thin kidney, tapering at heel end; skin white; flesh white; eyes shallow.
<i>Haulm and Foliage</i>		Early type of top, dwarf, weak, spreading; leaf open; leaflets small, flat, narrow; secondary leaflets inconspicuous; wings straight; stems weak, pink tinge towards maturity.
<i>Flowers</i>	..	None observed.

EARLY MAINCROP VARIETY

"Ranger"

<i>Sprout</i>	..	Pink.
<i>Tuber</i>	..	Kidney; skin white; flesh yellow; eyes shallow.
<i>Haulm and Foliage</i>		Medium height, spreading; leaf close; leaflets long, wrinkled, glossy; secondary leaflets large; wings markedly crinkled; stems green.
<i>Flowers</i>	..	Reddish purple tipped white; pale anthers.

LATE MAINCROP VARIETIES

"Aitán Cairn"

<i>Sprout</i>	..	Pink.
<i>Tuber</i>	..	Kidney; skin white; flesh white; eyes shallow.
<i>Haulm and Foliage</i>		Tall, vigorous, upright, spreading later; stems slightly coloured, strong, branching freely; wings waved; leaf markedly open, rigid, midrib slightly coloured at base of leaflet stalks; leaflets medium green, dull.
<i>Flowers</i>	..	Dark red purple with large tips of white; buds red purple.

"Sutton's Manifold"

<i>Sprout</i>	..	Pink.
<i>Tuber</i>	..	Round; skin white; flesh white; eyes deep.
<i>Haulm and Foliage</i>		Medium height, moderately strong, compact; colour grey-green; leaf dropping; leaflets small, dull, wrinkled; wings straight; slight pink tinge on stems.
<i>Flowers</i>	..	None observed; pink buds dropping freely.

* * * * *

THE index number for agricultural produce in January recorded an increase of 4 points to 107. This is partly due to the fact that the prices in the corre-

The Agricultural Index Number 13, were mostly below the December level and partly to increases in the values of barley, oats and fat stock.

Monthly index number of prices of Agricultural Produce. (Corresponding months of 1911-13=100.)

<i>Month</i>				1928	1929	1930	1931	1932	1933
January	..	..	..	145	145	148	130	122	107
February	..	..	..	143	144	144	126	117	—
March	..	..	..	145	143	139	123	113	—
April	..	..	..	151	146	137	123	117	—
May	..	..	..	154	144	134	122	115	—
June	..	..	..	153	140	131	123	111	—
July	..	..	..	145	144	134	121	106	—
August	..	..	..	144	152	135	121	105	—
September	..	..	..	144	152	142	120	104	—
October	..	..	..	139	142	129	113	100	—
November	..	..	..	141	144	129	112	101	—
December	..	..	..	140	143	126	117	103	—

Grain.—In January, wheat again averaged 5s. 3d. per cwt. and the index was unaltered at 72. Barley and oats, however, were both 1d. dearer on the month at 7s. and 5s. 9d. per cwt. respectively and the relative indices were 3 points higher at 87 and 84. * In January, 1932, wheat averaged

5s. 10d., barley 8s. 3d. and oats 7s. per cwt. and the respective indices were 80, 103 and 102.

Live Stock.—All descriptions of fat stock were dearer in January than in the previous month. A rise of 1s. 3d. to 37s. 5d. per cwt. was recorded in the quotation for fat cattle and the index was 9 points higher at 110, while an advance of $\frac{3}{4}$ d. per lb. in the average for fat sheep was reflected in the index of 107 which was 16 points above the December figure. Bacon and pork pigs realized only slightly higher prices, but a decline occurred in the base period and the indices for both descriptions rose by 7 points to 99 and 110 respectively. The price of dairy cows was lower on the month and the index was reduced one point to 113, but in the case of store cattle, the slight fall in values was much less than that in January, 1911-13, and the index moved upwards by 4 points to 107. Store sheep averaged 4s. 6d. and store pigs nearly 2s. per head more than in December, 1932, and the indices were 11 and 13 points above the figures for that month at 83 and 121.

Dairy and Poultry Produce.—The January quotation of 14s. 3d. per 12 lb. for butter compared with 14s. 9d. a month earlier and the index fell one point to 97. A reduction of 3s. 4d. per 120 in the average price of eggs, however, was proportionately smaller than that which occurred in the pre-war period, and a rise of 2 points brought the index to 94. As regards cheese, a fall in the January base price was the cause of the index advancing 5 points to 119, the average value for January being unaltered on the month. There was also no change in the average for milk sold under contract during the month under review and an index of 155 was again recorded, this being one point above that for January, 1932. The combined index of 121 for poultry was 6 points higher on the month, chickens and ducks both being dearer.

Other Commodities.—Potatoes averaged nearly 5s. per ton more than in December, but this increase was smaller than that of the pre-war period and a drop of 4 points occurred in the index figure to 116. Hay sold at the same prices as in December, but there was a slight advance in the 1911-13 level and the combined index fell 2 points to 65. Some vegetables were cheaper on the month, but these decreases were offset by slight increases for other descriptions and the combined figure rose by one point to 25 per cent. above pre-war. There was no change in the price of wool, the index of 64 being 2 points above the previous month owing to a slight fall occurring in the base period.

Monthly index numbers of prices of individual commodities.
(Corresponding months of 1911-13=100.)

Commodity	1931	1932	1932			1933
	Jan.	Jan.	Oct.	Nov.	Dec.	Jan.
Wheat	76	80	75	72	72	72
Barley	103	103	95	86	84	87
Oats.. ..	84	102	90	85	81	84
Fat cattle	127	119	102	101	101	110
„ sheep	150	110	83	87	91	107
Bacon pigs	134	96	82	85	92	99
Pork „	157	110	88	92	103	110
Dairy cows	133	123	118	117	114	113
Store cattle	128	121	100	97	103	107
„ sheep.. ..	148	100	72	70	72	83
„ pigs	214	127	89	95	108	121
Eggs	123	107	121	112	92	94
Poultry	147	127	126	121	115	121
Milk	162	154	145	152	155	155
Butter	114	108	95	97	98	97
Cheese	121	122	114	115	114	119
Potatoes	171	303	120	123	120	116
Hay	92	75	67	67	67	65
Wool	78	80	62	62	62	64

* * * * *

THE decline in the prices of agricultural produce, which has been a feature of the past few years, was continued in 1932, so that the general index figure for **The Annual Index** the year was 112, or only 12 per cent. **Numbers of Agricul-** above the level of the base years 1911-13, **tural Produce in** as compared with 120 in 1931 and 134 in **1932** 1930. As in 1931, it was the serious fall

in the values of live stock, especially fat cattle and sheep, which accounted for the greater part of the fall of 8 points in the general index, although the decline in values for barley, hay, wool and milk also contributed. These decreases were offset to a slight degree by an increase in values of oats, cheese, potatoes, hops and fruit.

Grain.—The prices of home-grown wheat were again at a low level during the year 1932, but the movement during the twelve months was rather more normal than in the previous year, values rising gradually until August, when the average was 6s. 5d. per cwt., and then falling with the marketing of the new crop to 5s. 3d. per cwt. in December. A year previously prices rose sharply in November to 6s. 9d., following on the country's departure from the "gold standard,"

and averaged 6s. 4d. in December. Over the whole year, wheat averaged 5s. 11d. per cwt. or 2d. per cwt. more than in 1931, and the index of 78 was 2 points higher on the year. Quotations for English barley followed their usual trend, but whereas values during the first six months were rather above those of the corresponding months of 1931, the new crop realized much lower prices than a year ago, the September average being 8s. 7d. per cwt. as against 9s. 10d. in 1931. In consequence, the annual average of 7s. 7d. per cwt. in 1932 was 4d. below the 1931 figure and the index 4 points lower at 96. During the period January to August, 1932, home-grown oats were considerably dearer than a year ago and the monthly indices were consistently above pre-war, but subsequently prices fell sharply, and in December the average was 5s. 8d. per cwt. as compared with 6s. 11d. per cwt. in December, 1931, the respective indices being 81 and 99. The annual average of 7s. per cwt. in 1932 was, however, almost equal to pre-war, whereas in 1931 it was 12 per cent. below that level.

Fat Stock.—In January, 1932, fat cattle were 3s. per cwt. cheaper than in January, 1931. Prices subsequently advanced, in accordance with the usual tendency in the spring months, and in May were almost 4s. per cwt. higher than at the commencement of the year, as compared with an average rise of only 2s. 3d. in this period in the previous three years. The decline which followed was, however, much more severe than in the years 1929 to 1931, amounting to about 9s. per cwt. against an average of 6s. in those three years. In November, 1932, the index was only 101, the lowest point reached since November, 1912. The average value for 1932 was fully 2s. 6d. per cwt. lower than in 1931, and the index fell 7 points to 115.

Values for fat sheep declined throughout the greater part of 1932, and after June, when the index was 107, the indices were consistently below the pre-war level. The lowest point reached was in October when the average of 6d. per lb. was 17 per cent. below that of the corresponding month of 1911-13. A decided recovery occurred in November and December, the index moving upwards to 91 in the latter month. Over the whole year, sheep averaged 7½d. per lb. as compared with 10d. in 1931, and the index was 36 points lower at 97.

In the first five months of 1932, values for fat pigs showed some seasonal improvement from those ruling at the close of 1931, the index for baconers rising to 103 and for porkers to 126 in May. Throughout the summer and autumn, however,

quotations were considerably below those of the previous year, and although in December prices of both baconers and porkers recovered to about the same level as a year previously, the 1932 average price for baconers was 1s. 7d. and for porkers 2s. 8d. per score below 1931, the relative indices being 91 and 98 in 1932 as compared with 107 and 123 in 1931.

Dairy and Poultry Produce.—For the nine months ended September, 1932, milk prices generally were below those recorded in the corresponding period of 1931, especially in March when the price was reduced to summer levels. For the year commencing in October, 1932, however, much better prices were obtained by farmers for the six winter months October, 1932, to March, 1933, than in the corresponding period of 1931-32. On average, however, milk sold under contract during 1932 realized 44 per cent. above 1911-13, or 3 points less than a year earlier. Butter was cheaper throughout the whole of the year under review and averaged 13s. 9d. per 12 lb. as against 15s. in 1931, the annual index being 102 as compared with 111. Cheese, however, generally realized higher rates and the index rose 11 points to 127. Eggs commenced the year on a lower level than a year ago, and although the customary rise in the summer brought the price in September to rather more than in September, 1931, quotations subsequently were regularly below those of the previous season and the average for 1932 of 12s. 6d. per 120 was only 9 per cent. above pre-war, as compared with 16 per cent. in 1931. Poultry also were cheaper and the index figure of 128 was 16 points below that of a year earlier.

Other Commodities.—Potatoes and hops were, as in 1931, notable exceptions to the general fall in prices of agricultural produce. The advance in the annual average for the former, however, was due solely to the exceptionally high prices ruling in the first six months of 1932, as a result of a short crop in 1931. With the advent of the 1932 crop, values fell to an exceptionally low level paralleled only in recent years by that in 1929. The index in September was only 114 as against 213 in June. On the year, as a whole, potatoes realized 97 per cent. more than in 1911-13 and were 5 per cent. dearer than in 1931. The sale of the 1932 hop crop was controlled by the Hop Marketing Board and the prices realized have been considerably above those of the previous three years, the annual index being 105 as compared with 77 in 1931 and 47 in 1930. Values for hay continued to fall throughout 1932 and for the whole year averaged 31 per cent. below 1911-13. In 1931 hay realized 14 per cent. less than in the base period.

Exceptionally low prices for wool were recorded at the country wool sales in 1931, but in 1932 quotations ruled even lower and the index was only 45, as compared with 52 in 1931, a fall of over 13 per cent. on the year. All descriptions of fruit were dearer than in 1931, considerable increases being shown in the values of cherries, currants, gooseberries and plums, and the general index for fruit was 48 points higher on the year at 180. Brussels sprouts, cabbage and celery were generally cheaper throughout 1932 as compared with the previous year, and carrots and onions were cheaper in the latter half of 1932. The increase of 13 points in the index for vegetables to 153 was due entirely to the exceptionally high prices realized for carrots and onions in the spring of 1932.

Yearly Index Numbers of Prices of Agricultural Produce during the Years 1927 to 1932 (1911-13=100).

Commodity	1927	1928	1929	1930	1931	1932
Wheat	152	132	130	105	76	78
Barley	148	139	125	100	100	96
Oats	128	147	125	87	88	99
Fat cattle ..	127	138	133	133	122	115
Fat sheep ..	150	167	157	160	133	97
Pigs, baconers ..	144	135	160	153	107	91
Pigs, porkers ..	155	138	165	165	123	98
Hay	108	111	125	118	86	69
Potatoes .. .	174	171	117	96	188	197
Milk	160	161	169	161	147	144
Butter	143	151	152	128	111	102
Cheese	146	173	158	130	116	127
Poultry	139	149	152	147	144	128
Eggs	145	146	159	136	116	109
Fruit	169	183	159	117	132	180
Wool	137	176	126	82	52	45
Beans and peas ..	129	133	135	100	74	76
Vegetables ..	147	176	164	138	140	153
Hops	137	126	51	47	77	105
General Index	144	147	144	134	120	112

Farm Workers' Minimum Wages.—A meeting of the Agricultural Wages Board was held at 7 Whitehall Place, London, S.W.1, on Monday, February 20, 1933, the Rt. Hon. Viscount Ullswater, G.C.B., presiding.

The Board considered notifications from Agricultural Wages Committees of decisions fixing minimum and overtime rates of wages and proceeded to make the following Orders :—

Beds. and Hunts.—An Order continuing, with a modification in respect of the week in which Christmas Day falls, the operation of the minimum and overtime rates of wages from February 26, 1933 (i.e., the day following that on which the existing rates are due to expire), to February 24, 1934. The minimum rates in the

case of male workers of 21 years of age and over are 30s. 6d. per week of 42½ hours in the weeks in which Easter Monday and Whit Monday fall, 52 hours in any other week in summer, 31 hours in the week in which Christmas Day and Boxing Day fall (instead of 39½ hours as formerly) and 48 hours in any other week in winter, with payment for overtime employment at 9d. per hour on weekdays, 10d. per hour on Easter Monday, Whit Monday, Christmas Day and Boxing Day, and 11d. per hour on Sundays. In the case of female workers of 18 years of age and over, the minimum rate is 6d. per hour with overtime at 7½d. per hour on weekdays, 8½d. per hour on Easter Monday, Whit Monday, Christmas Day and Boxing Day, and 9d. per hour on Sundays.

Kent.—An Order fixing minimum and overtime rates of wages to come into operation on March 1, 1933 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 3, 1934. The minimum rates in the case of male workers of 21 years of age and over employed wholly or mainly as horsemen, stockmen or shepherds are 33s. per week (as at present) of 42½ hours in the weeks in which Good Friday and Christmas Day fall, and 52 hours in any other week. In the case of other male workers of 21 years of age and over the minimum rates are 32s. 6d. per week (as at present) of 42½ hours in the week in which Good Friday falls, 52 hours in any other week in summer, 39 hours in the week in which Christmas Day falls and 48 hours in any other week in winter, with payment for overtime in the case of all classes of male workers of 21 years of age and over at 8d. per hour on weekdays and 9d. per hour on Sundays, Good Friday and Christmas Day (instead of 9d. and 10d. per hour, respectively, as at present), except that the overtime rate payable to horsemen, stockmen, and shepherds for customary duties is 8d. per hour (instead of 9d., as at present). In the case of female workers of 18 years of age and over, the minimum rate is 5½d. per hour with overtime at 6d. per hour on weekdays and 6½d. per hour on Sundays, Good Friday and Christmas Day (instead of 6½d. and 7d. per hour, respectively, as at present).

Lincs. (Kesteven and Lindsey).—An Order continuing the operation of the minimum and overtime rates of wages from March 6, 1933 (i.e., the day following that on which the existing rates are due to expire), to March 4, 1934. The minimum rates in the case of male workers of 21 years of age and over are : for waggoners, 37s. per week of 52½ hours in the weeks in which Good Friday and Christmas Day fall, 61 hours in any other week from October 15 to May 13, and 58 hours in any other week during the remainder of the year ; for shepherds, 35s. per week of 45½ hours in the week in which Good Friday falls, 55 hours in any other week in summer, 47½ hours in the week in which Christmas Day falls and 56 hours in any other week in winter, with additional payments for the lambing season ; for stockmen, 36s. per week of 46½ hours in the week in which Good Friday falls, 56 hours in any other week in summer, 39½ hours in the week in which Christmas Day falls and 58 hours in any other week in winter ; and for other male workers, 30s. per week of 43½ hours in the week in which Good Friday falls, 53 hours in any other week in summer, 39½ hours in the week in which Christmas Day falls and 48 hours in any other week in winter, with payment for overtime employment in the case of all classes of adult male workers at 9d. per hour on weekdays and 11d. per hour on Sundays. In the case of female workers of 17 years of age and over, the minimum rate is 5½d. per hour for all time worked. *

Middlesex.—An Order continuing the operation of the minimum and overtime rates of wages from March 1, 1933 (i.e., the day following that on which the existing rates are due to expire), to March 3, 1934. The minimum rates in the case of male workers of 21 years of age and over are 41s. 3d. per week of 60 hours in the case of stockmen, 38s. 6d. per week of 56 hours in the case of carters, 34s. 4½d. per week of 50 hours in summer and 33s. per week of 48 hours in winter for other whole time workers, and 8½d. per hour for casual workers with payment for overtime employment in each case at 10½d. per hour. In the case of female workers of 18 years of age and over, the minimum rates are 30s. per week of 60 hours for workers employed on the duties of stockmen, 28s. per week of 56 hours for carters, 25s. per week of 50 hours in summer and 24s. per week of 48 hours in winter for other whole-time workers and 6d. per hour for casual workers with payment for overtime at 7½d. per hour in all cases.

Monmouthshire.—An Order continuing the operation of the minimum and overtime rates of wages from March 16, 1933 (i.e., the day following that on which the existing rates are due to expire), to March 15, 1934. The minimum rates in the case of male workers of 21 years of age and over are 31s. per week of 54 hours in summer and 50 hours in winter, with payment for overtime employment at 9½d. per hour on weekdays and 11½d. per hour on Sundays, Good Friday, Easter Monday, Whit Monday, August Bank Holiday, Christmas Day and Boxing Day. In the case of female workers of 17 years of age and over, the minimum rate is 6d. per hour for all time worked.

Somerset.—An Order cancelling the existing minimum and overtime rates of wages and fixing fresh rates in substitution therefor to come into operation on March 16, 1933, and to continue in force until December 23, 1933. The minimum rates in the case of male workers of 21 years of age and over are 30s. 6d. per week (as at present) of 50 hours in any week in winter, 42½ hours in the weeks in which Good Friday, Easter Monday and Whit Monday fall, 42½ hours (instead of 52 hours as formerly) in the week in which August Bank Holiday falls and 52 hours in any other week in summer, with payment for overtime employment at 9d. per hour, except that for overtime employment on the hay and corn harvests the rate is 10d. per hour. The minimum rate for female workers of 21 years of age and over is 6d. per hour for all time worked.

Sussex.—An Order continuing the operation of the minimum and overtime rates of wages from April 10, 1933 (i.e., the day following that on which the existing rates are due to expire), to March 25, 1934. The minimum rates in the case of male workers of 21 years of age and over are: for workers employed wholly or mainly as horsemen, cowmen, stockmen or shepherds, 36s. per week of 50 hours in the weeks in which Good Friday, Whit Monday and Christmas Day fall, and 58 hours in any other week, and for other workers, 31s. per week of 44 hours in the weeks in which Good Friday and Whit Monday fall, 52 hours in any other week in summer, 40 hours in the week in which Christmas Day falls and 48 hours in any other week in winter, with payment for overtime employment in the case of all classes of adult male workers at 9d. per hour on weekdays and 10½d. per hour on Sundays. In the case of female workers of 18 years of age and over, the minimum rate of wages is 5d. per hour with overtime at 6½d. per hour on weekdays and 7½d. per hour on Sundays.

Worcestershire.—An Order fixing minimum and overtime rates of wages to come into operation on March 6, 1933 (i.e., the day following that on which the existing rates are due to expire),

and to continue in force until March 3, 1934. The minimum rates in the case of male workers of 21 years of age and over are 30s. per week (as at present) of 45 hours (instead of 44 hours as formerly) in the week in which Good Friday falls, 54 hours (instead of 53 hours in summer as formerly) in any other week from March 6, 1933, to November 4, 1933, 39½ hours in the week in which Christmas Day falls, 48 hours in any other week from November 5, 1933, to February 3, 1934, and 50 hours (instead of 48 hours throughout winter as formerly) from February 4, 1934, to March 3, 1934, with payment for overtime employment at 7d. per hour until November 4, 1933, and 7½d. per hour during the rest of the year (instead of 8d. per hour throughout the year as formerly). In the case of female workers of 18 years of age and over, the minimum rate is 5d. per hour for all time worked.

Glamorganshire.—An Order fixing minimum and overtime rates of wages to come into force on March 2, 1933 (i.e., the day following that on which the existing rates are due to expire), and to continue in operation until March 1, 1934. The minimum rates in the case of male workers of 21 years of age and over employed wholly or mainly as stockmen, cattlemen, cowmen, horsemen, shepherds or bailiffs are 36s. (instead of 35s. as at present) per week of 60 hours with payment for overtime at 10d. per hour, and in the case of other male workers of 21 years of age and over, 32s. 6d. (instead of 31s. 6d. as at present) per week of 52 hours in summer and 48 hours in winter, with payment for overtime employment at 9d. per hour on weekdays and 10d. per hour on Sundays. In the case of female workers of 18 years of age and over, the minimum rate is 6d. per hour with payment for overtime employment at 7d. per hour on weekdays and 7½d. per hour on Sundays.

Merioneth and Montgomery.—An Order varying as from March 5, 1933, the existing minimum and overtime rates of wages, the variations to remain in force until April 30, 1933. The minimum rates as varied are: in the case of male workers of 21 years of age and over employed wholly or mainly as stockmen, teamsters, carters or shepherds, 31s. (instead of 32s. 6d. as at present) per week of 60 hours and in the case of other male workers of 21 years of age and over, 27s. (instead of 28s. 6d. as at present) per week of 54 hours with payment for overtime employment in each case at 9d. per hour. In the case of female workers of 18 years of age and over, the minimum rate is 5d. per hour for all time worked.

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Enforcement of Minimum Rates of Wages.—During the month ending February 14, 1933, legal proceedings were taken against six employers for failure to pay the minimum rates of wages fixed by the Orders of the Agricultural Wages Board. Particulars of the cases follow:—

Committee area	Court	Fines imposed			Costs allowed			Arrears of wages ordered			No. of workers involved
		£	s.	d.	£	s.	d.	£	s.	d.	
Cheshire ..	Crewe ..	10	0	0	0	7	6	30	0	0	1
Durham ..	Chester-le-Street ..			—	2	2	0	49	3	3	4
Hereford ..	Leominster	1	0	0	0	3	6	3	8	11	1
Northampton ..	Thrapston ..	10	0	0	—			44	5	6	4
Somerset ..	Long Ashton	4	0	0	—			*23	0	0	2
Worcester ..	Bromsgrove	5	0	0	—			5	0	0	2
		* £30	0	0	£2	13	0	£154	17	8	14

* In addition to £5 previously paid to each worker.

Foot-and-Mouth Disease.—Since the last issue of this JOURNAL went to press the Ministry has confirmed the existence of 10 cases of foot-and-mouth disease in Great Britain. These cases occurred in the counties of Buckingham, Oxford, Southampton, Stafford, Surrey and Wiltshire and the movement of cattle, sheep, goats, pigs and deer around the premises on which the disease was found to exist has been prohibited in accordance with the usual practice.

The Standstill Order to which reference was made in the February issue has now been revoked.

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APPOINTMENTS

COUNTY AGRICULTURAL EDUCATION STAFFS : ENGLAND

Derbyshire: Mr. G. B. Brook, M.R.C.V.S., B.Sc. (Vet. Science), Edin., has been appointed Veterinary Education Officer, *vice* Mr. L. B. A. Grace, M.R.C.V.S., D.V.S.M.

Shropshire: Miss M. G. L. Sinclair has been appointed Assistant Instructor in Poultry-keeping, *vice* Miss G. Spurr, N.D.P.

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NOTICES OF BOOKS

The Tractor in Agriculture. (*Der Schlepper in der Landwirtschaft*.) By N. Jasny. Pp. 156; 22 diagrams and illustrations. (Berlin: Paul Parey, 28 and 29 Hedemannstrasse, S.W.11. Price, RM. 12.60.)

This work is a very careful study of the use of the tractor in agriculture. As might be expected, it is mainly concerned with a comparison of the efficiency of the tractor as compared with the horse, and explores this problem in all its aspects with meticulous care. Aside from the technicalities involved, it deals fully with the question of costings, and provides a general survey of the work that has been done in this connexion in the United States and elsewhere. The author provides some interesting conclusions relating to the use of various types of tractors under different farming conditions, but he thinks that the machine is particularly applicable to countries engaged in extensive arable farming for the production of corn for export, and that it is more especially useful in association with the modern combine-harvester.

The author points out that in comparing horse costs with tractor costs it must be borne in mind that the former are mainly fixed while the latter are variable, and he especially emphasizes the fact, already well established, that tractor costs fall as the number of working hours per diem and per annum is increased. In making a comparison between a living animal and a machine, moreover, the question of fatigue enters very largely into the question, because the machine can be used continuously day and night when conditions are favourable, whereas horses must rest.

The few points noted above may serve to indicate the nature of this work, which has clearly been carefully prepared and should not be neglected by those who are engaged in the application of mechanization to the problems of farm production or in the study of the results of this tendency.

The Din of a Smithy. By J. A. R. Stevenson. Foreword by the Rt. Hon. Walter Runciman. Pp. xvii+172 and 128 illustrations. (London: Chapman & Hall, Ltd. 1932. Price, 15s.)

Under this arresting but unrevealing title Mr. Stevenson has written a book that every blacksmith and most architects ought to read. It is in fact an A. B. C. of smithery, not only from the technical, but from the

business and human standpoints. The author relates (with divergences never far from the point or wearisome to one intent on following) the story of how he came to be a smith, and of the fortunes of the business which he has established. Not only that, but he gives a very complete description of a smith's tools and of the processes necessary to the forging of three typical objects—a trivet, a candlestick, and a gate—and *inter alia* introduces us to his theories on handicraft and his philosophy of life: and it all makes good reading. At the end the reader feels that the author is well known to him. His enthusiasm and disarming self-confidence are charming, but he probably underrates the degree to which power of design rather than honesty in craftsmanship have been responsible for the considerable degree of success which his smithery has attained. A hopeful examination of many displays of blacksmiths' work at Rural Industries Exhibitions has made it evident that as a rule it is just this quality that is often missing. However laborious and honest such works may be, the absence of a simple idea knitting the whole together, or the presence of a bunch of discordant motives or conflicting forms in one object, must condemn the most painstaking efforts. It is not only the "pencil-pushing" class of designer that has "forgotten the value of simple things," as the author says. It is perfectly true that "incoherent things are not criticizable; the critical faculty can only grasp an object to the extent to which the eye can embrace it." Hence the value of a definite scheme, as evident in such examples as the gates shown facing pages 89, 92, and 94 of this book—sterling examples of suitable design as well as of legitimate smithery.

French Intensive Gardening on Money-making Lines. By A. J. Macself. Pp. 128, illus. (London: W. H. & L. Collingridge, Ltd. 1932. Price 7s. 6d.)

The author uses the term "French Gardening" to include several methods of growing vegetable and salad crops so as to obtain a maximum return from the smallest area in the shortest space of time. Practical suggestions are made for the lay-out of an intensive garden, to include hot-beds (covered with frames or glass cloches), uncovered beds or borders, and a small glasshouse. The most suitable crops for intensive cultivation are shown to be small vegetables and tender salads such as are demanded by French chefs in London and are gaining in popularity with the English public. The chief crops for growing on the hot beds—carrots, lettuce, cauliflowers, etc.—are described in detail, and suggestions follow as to suitable outdoor and glasshouse "minor" crops and "permanent" crops such as asparagus and rhubarb. The reader who is taking up intensive gardening must, however, select for himself which of these crops he is to grow, particularly if he is disposing of his produce through the wholesale markets, where small irregular consignments are increasingly difficult to sell. The book should give a useful stimulus to the development of this system of production at a time when tariffs and import duties make it likely to be particularly remunerative.

The Farm and the Nation. By Sir E. John Russell, D.Sc., F.R.S. Pp. 240. (London: Geo. Allen & Unwin, Ltd. 1933. Price 7s. 6d.)

In this volume Sir John Russell discusses with sympathy and understanding various factors involved in the preservation and development of our agriculture in the interests of the national wealth and of the large army of unemployed. The book contains the essence of a life study of British agriculture, fortified by personal observation and examination of agriculture in other countries. There have been crises before, notably in the decade following the Napoleonic Wars, and in

the change in world conditions of agricultural production which arose after the seventies and eighties of last century. Mr. Smith has made it clear that it was these migrant farmers who were most successful in making the necessary changes. It was only after the visual evidence of their successful example that native farmers of the areas to which they had come were induced to make the alterations in their systems of farming necessary to enable them to cope with the new conditions, and to place their production on something of an economic basis.

Agricultural Co-operation in Scotland and Wales. *A Survey by the Horace Plunkett Foundation.* Pp. xi+246. (London: George Routledge & Sons, Ltd. 1932. Price 7s. 6d.)

With the publication of this volume the Horace Plunkett Foundation completes the survey of Agricultural Co-operation in the British Isles. The three volumes of the series, by the apt combination of detail and generalization, and the adoption of uniform approach to and presentation of the material, will serve as standard works of reference for some time to come. The inclusion of the Scottish and Welsh surveys in one volume serves the very useful purpose of contrasting the development of agricultural co-operation in two countries which raise much the same kind of farm products. The outstanding difference is the pre-occupation of the movement in Wales with the supply of farm and household requirements, whereas in Scotland three-quarters of the total business of societies is done in the sale of farm products. Another feature of the movement in both countries is that, despite the fact that most of the farms can be regarded as small, the credit society has never flourished.

Close examination of the evidence suggests that there is yet much scope for expanding and raising the level of business efficiency on the part of societies engaged in the sale of requisites, a long-established form of economic organization. Owing, however, to the prominence nowadays given to marketing, the majority of readers are more likely to be concerned with the record of efforts to sell co-operatively. The history of local societies in Scotland and Wales affords not a few illustrations that co-operatives have failed adequately to appreciate the necessity of providing a better market service than those whom they seek to displace. Moreover, as implied by Sir John Gilmour in the "Foreword," experience, particularly in Scotland, suggests that there is a definite limit to which producer-organization on a voluntary basis can tackle the major problems associated with the adjustment of supply to demand. There is no need to regard the co-operative as the final form of collective effort in agricultural commerce, and it is to be hoped that the Agricultural Organization Societies in Scotland and Wales will continue as pioneers in building up the most efficient form of service to the industry.

Asparagus : Natural and Artificial Cultivation. (*L'Asperge : Culture Naturelle et Artificielle.*) XIth Edition. By F. Lesourd. Pp. 160 and 56 Figures. (Paris : Librairie Agricole de la Maison Rustique. Price 10 francs.)

In small compass this brochure contains a very comprehensive account of French methods of growing asparagus, including intensive and "field" systems, and several methods of forcing, while further chapters are devoted to the discussion of manurial treatment, the raising of crowns, harvesting and costs of production. The book is clearly illustrated by photographs and diagrams; the wealth of details given will suggest many reasons for the exceptionally fine results obtained by French growers, and British readers can glean many useful hints for the improvement of their methods.

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